THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVI. No. 1953.] LONDON, OCTOBER 16, 1900. [52ND YEAR. PRICE 6d.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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HEBBURN MAIN GAS COALS.

Yield of Gas per Ton . 10,500 Cubic Feet.
Illuminating Power . . . 16·4 Candles.
Coke . . . . . 68 per Cent.

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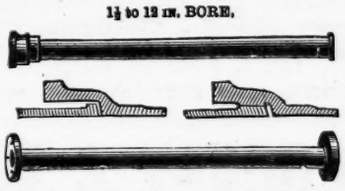
The Wallsend & Hebburn Coal Company, Ltd.
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

GAS AND WATER PIPES
1¼ to 12 IN. BORE.



THOMAS ALLAN & SONS,
Bonlea Foundry,
SOUTH STOCKTON-ON-TEES.
Formerly Springbank Iron-Works, Glasgow.
ESTABLISHED 1848.
ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.
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GAS-LEAK INDICATOR.
For Particulars and Price apply to
ORMSIDE STREET, LONDON, S.E.
ESTABLISHED 1830.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
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Prices and Analysis of all the Scotch Cannels on Application.

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

THE "MELDRUM" FURNACE

At "The SHEFFIELD TELEGRAPH" Offices.

Reprinted from "The SHEFFIELD TELEGRAPH" June 27, 1900.

A SAVING IN FUEL OF £18 PER WEEK.

A couple of months ago when coal, which formerly cost us 8s. per ton rose to 12s. 6d., we read a lecture on the cost of steam production by John Holliday, in which the following paragraph appeared:—

Mr. Bryan Donkin, M.Inst.C.E., has published figures from some tests he carried out with different kinds of fuel in the same boiler, the conditions in all cases being the same; the results are comparable on the basis of the cost of fuel required to evaporate 1000 gallons.

Kind of Fuel.	Cost of Fuel per Ton.	Water Evaporated per Pound of Fuel.	Cost of Fuel per 1000 Gallons Evaporated.
	s. d.	lbs.	s. d.
A. Dust Coke	5 0	6	3 8
B. „ Welsh Coal . . .	10 0	8	5 3
C. Large „ . . .	22 0	9	10 11

Discovering that the Sheffield Gas Company made a considerable quantity of coke dust, which they gave away to builders and others, we entered into a contract for a supply for three years. Having a spare boiler, we had Meldrums' forced draught fitted, and soon discovered that coke dust made a very satisfactory fuel for steam raising. Our second boiler was then fitted, and we are now burning coke dust on the two almost exclusively. From an economical point of view, the experiment is very satisfactory, as will be seen from the following figures:—

Average week, Coal only, on One Boiler.

	£ s. d.
45 Tons at 12s. 6d.	28 2 6
Ashes at 2s., Seven Loads	14 0
	£28 16 6

Present Consumption on Two Boilers.

	£ s. d.
Six Tons of Coal at 9s. 3d.	2 15 6
Coke Dust	3 4 0
Two extra Stokers	2 12 0
Flues cleaning	10 0
Ashes, 12 Loads at 2s.	1 4 0
	£10 5 6

We shall be pleased to show the arrangement to anyone interested in the subject of the economical production of steam. There is no smoke from the chimney stack of the "Telegraph" Office, which is another good point in favour of coke dust as fuel.

Makers and Sole Proprietors: **MELDRUM BROTHERS, LTD.,**
Engineers, ATLANTIC WORKS, MANCHESTER.

LONDON OFFICES: 66, Victoria Street, Westminster. LEEDS OFFICES: 5, East Parade.

Telegrams "MELDRUM" Manchester, London, or Leeds. National Telephone: Nos. 1674, Manchester; 193, Westminster; 1391, Leeds.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

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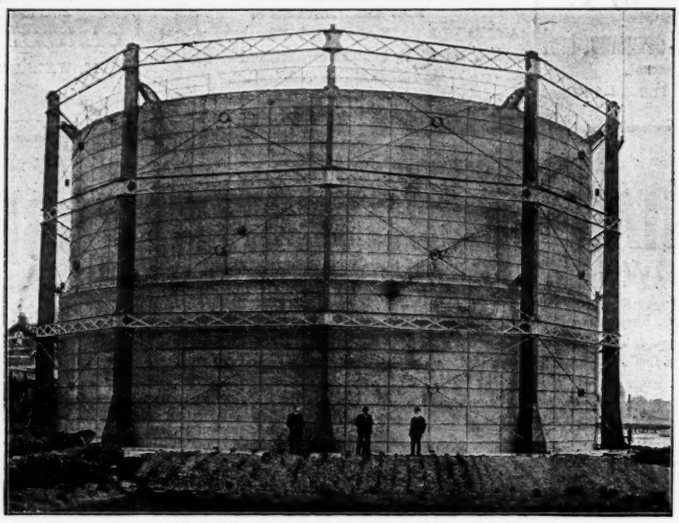
GASHOLDERS IN EITHER STEEL OR WROUGHT IRON.

GASHOLDER TANKS IN STEEL, WROUGHT OR CAST IRON.

CAST-IRON COLUMNS.

STEEL or WROUGHT IRON STANDARDS. *(Any Section.)*

INLET and OUTLET PIPES in either CAST or WROUGHT IRON, or STEEL.



HYDRAULIC MAINS.
FOUL MAINS.
CONDENSERS.
RETORT-LIDS.
PURIFIERS.
HYDRAULIC LIFTS.
ROOFS.
BOILERS in either WROUGHT IRON or STEEL.

LAMP COLUMNS, MAIN PIPES, and IRREGULARS always in Stock.

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WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

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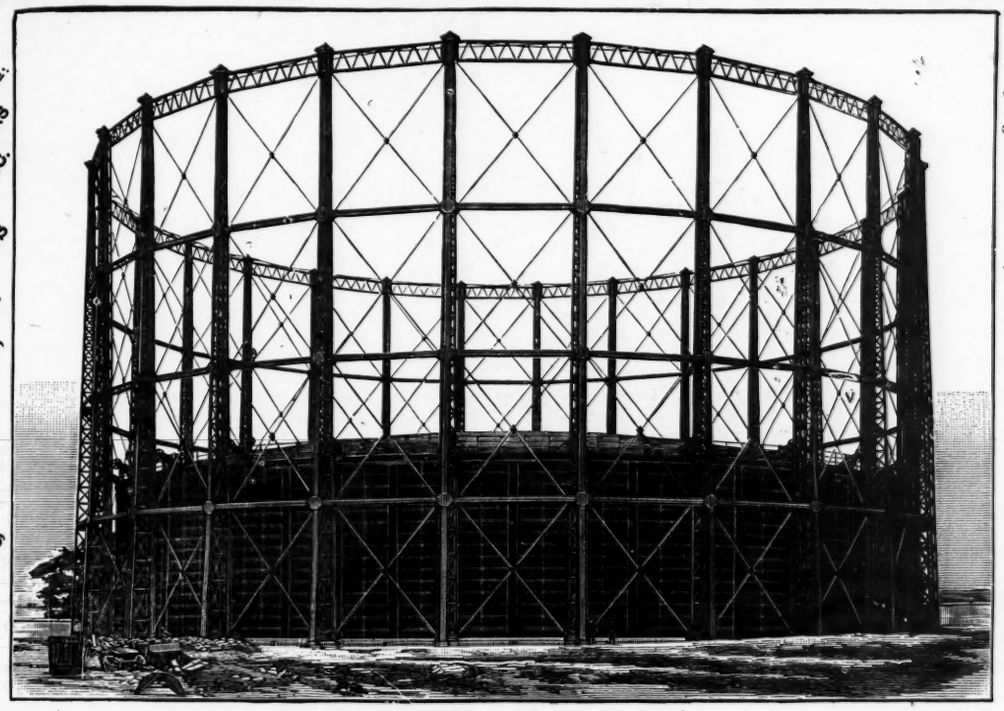
THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS BIRMINGHAM.

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MANUFACTURERS OF

Humphreys & Glasgow's Patent Carburetted Water-Gas Plant.

INSTALLATIONS HAVE ALREADY BEEN SUPPLIED, AND ARE IN HAND FOR THE FOLLOWING GAS-WORKS:—

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LIVERPOOL
TOTTENHAM
SWANSEA
MANCHESTER
BRIGHTON
PRESTON
SOUTHPORT
BATH
HOYLAKE
COVENTRY
WINCHESTER
SHANGHAI
STOCKPORT
NORWICH
LEA BRIDGE
DUNEDIN (N.Z.)
HULL
STAINES
EDINBURGH
STOCKTON-ON-TEES
TUNBRIDGE WELLS
GUILDFORD
BRENTFORD
COMMERCIAL GAS CO.
BRIDLINGTON
MIDDLESBROUGH
CROYDON
L. & N.W. RY., CREWE
TAUNTON
ROTTERDAM
DORKING
G.L.&C. CO., BROMLEY
DURHAM
SCARBOROUGH
PERTH (W.A.)
BREMEN
LINCOLN
LONGTON
COLNEY HATCH
SYDNEY (Harbour)
SYDNEY (Mortlake)
MAIDENHEAD
EPSOM
NORTH MIDDLESEX
WANDSWORTH
AARHUS
FALMOUTH
SOUTHAMPTON
HARTLEPOOL
UTRECHT
DEVENTER
PORTSMOUTH
BOURNEMOUTH
AYLESBURY
HAMBURG
DUBLIN
REDHILL
POSEN
FAVERSHAM
ANTWERP
BIRMINGHAM
HEBDEN BRIDGE
CHORLEY

SECOND CONTRACTS, &c.

COPENHAGEN
BELFAST
BRUSSELS
LIVERPOOL
COVENTRY
LEA BRIDGE
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COMMERCIAL (2nd)
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G.L. & C. CO., FULHAM
BRIGHTON
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CROYDON
MANCHESTER
TOTTENHAM (2nd)
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DUBLIN
SOUTHAMPTON
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THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

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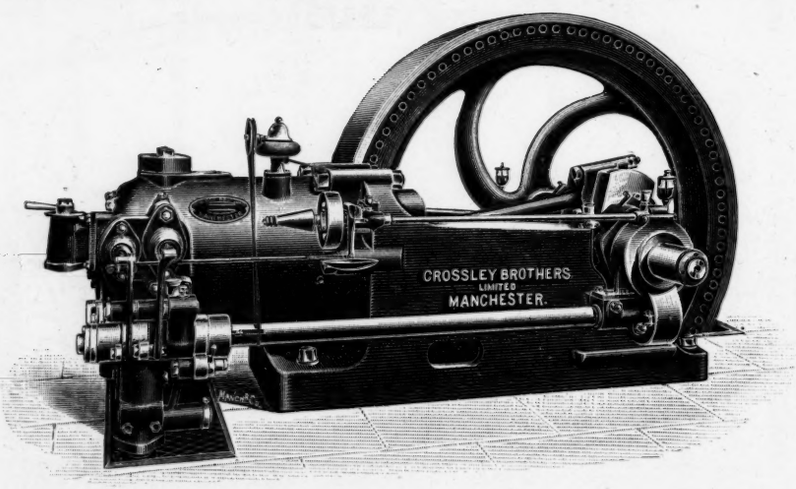

Represents approximately U.E. Type to Z.C.E. Type High-Speed Electric Light Engines of 40 to 150 Effective Horse Power.

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LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for Immediate Delivery.

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Manufacturers of every description of

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RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

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PURIFIERS with Planed Joints a Speciality.

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STRUCTURAL WORK, COLUMNS, GIRDERS, and ROOFING.

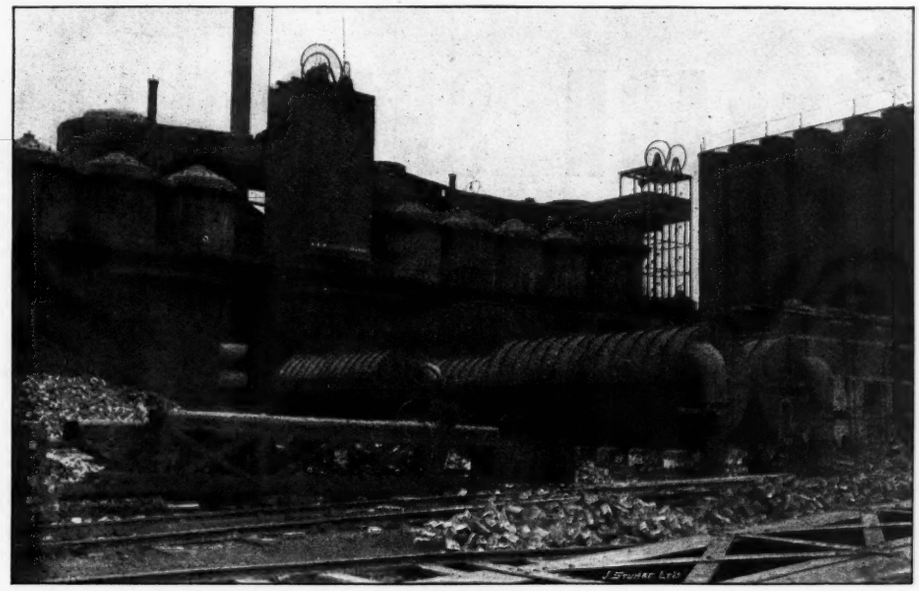
GASHOLDERS, Cast-Iron or Steel Tanks.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (Special Quality) for Engine Cylinders, GAS COAL famous for its UNRIVALLED EXCELLENCE.

W. C. HOLMES & CO.'S PATENT "NEW" SCRUBBER-WASHER.

IN VERTICAL OR HORIZONTAL FORM.



View showing batch of MACHINES for dealing with **5,000,000** Cubic Feet of Gas per diem, for the

EXTRACTION OF AMMONIA AND BENZOL.

SINCE IMPROVEMENTS PATENTED IN 1895-7,

The following Machines have been erected or are now on order:—

	Cubic Feet Per Diem.
KENDAL	500,000
GLASGOW (Four Machines)	1,250,000
Do. (Four Machines)	1,250,000
Do. (Four Machines)	2,000,000
Do. (Four Machines)	2,000,000
AMSTERDAM	2,000,000
BRYMBO	1,250,000
MORPETH	120,000
SHILDON	400,000
SUTTON-IN-ASHFIELD	200,000
CHATTERLEY	1,500,000
BROUGHTON-SOLVAY	1,250,000
Do. do.	1,000,000
KELSO	200,000
WISHAW	400,000
WIDNES (Two Machines)	1,000,000
Do. (Two Machines)	1,250,000
WOODSIDE (Two Machines)	400,000
Do. (Two Machines)	500,000
TODMORDEN	800,000
ABERDEEN	2,500,000
ECCLESHILL	250,000
LONGTON	1,000,000
PAISLEY (Vertical)	1,500,000
CARLTON IRON CO.	2,000,000
Do. do.	2,500,000
TALK-O-TH'-HILL	2,000,000
CARLTON IRON CO. (2nd Order)	1,250,000
SHETTLESTON	500,000
NANTWICH	250,000
NELSON	1,500,000
ST. ANDREW'S	500,000
SANDIACRE	200,000
JERSEY (Vertical)	500,000
BARRHEAD	500,000
MOTHERWELL	750,000
PADIHAM	500,000
PERTH (Vertical)	1,500,000
SEATON CAREW (Four Machines)	2,000,000
Do. do. (Four Machines)	2,000,000
Do. do. (Four Machines)	2,500,000
NORTH E. STEEL CO. (Four Machines)	1,000,000
Do. do. (Four Machines)	1,000,000
Do. do. (Four Machines)	1,250,000
Do. do. (Four Machines)	1,250,000
HURST MILLS	500,000
THRISLINGTON	1,000,000
Do.	1,250,000
SHERINGHAM	50,000
BRACKLEY COLLIERY	1,000,000
Do. do.	1,250,000
ORIENTAL GAS CO. (CALCUTTA)	1,250,000
BANGOR	1,000,000
CHATTERLEY (Vertical)	1,000,000
Do.	750,000
PLEANE COLLIERY	800,000
AMBLESIDE	120,000
PRESCOT	200,000
LLANDUDNO	500,000
CORK	1,500,000
BIRMINGHAM	2,500,000
FARNWORTH	500,000
FALMOUTH	500,000
BIRMINGHAM (2nd Order)	2,500,000
HARROGATE	1,000,000
HELENSBURGH	500,000
GARFORTH	50,000
MANCHESTER	3,500,000
WEST HARTLEPOOL	2,000,000
PAIGNTON	500,000
POCKLINGTON	50,000
STOURPORT	200,000
TROON	120,000
DUMBARTON (Vertical)	500,000
SALFORD	2,000,000
FALKIRK (Vertical)	1,000,000
STOKE-ON-TRENT	1,000,000
BRACKLEY COLLIERY (2nd Order)	1,000,000
Do. do. do.	1,250,000
CATERHAM	400,000
ILFORD	2,000,000
SEMET SOLVAY CO. (Six Machines)	3,000,000
Do. do. (Six Machines)	3,000,000
Do. do. (Six Machines)	3,000,000
Do. do. (Six Machines)	2,750,000
Do. do. (Six Machines)	2,750,000
Do. do. (Six Machines)	2,750,000
ROYAL ARSENAL (WOOLWICH)	2,000,000
ELLAND	1,000,000
NORMANTON	400,000
SUNDERLAND	2,000,000
BISHOP AUCKLAND	600,000
TYNEMOUTH	1,500,000
SELKIRK	500,000
BEVERLEY	500,000
HOLMFIRTH	200,000
COATBRIDGE	1,000,000
CARLTON IRON CO. (3rd Order)	1,500,000
JOHNSTONE (Vertical)	500,000
ILKESTON	1,000,000
HASTINGS	2,000,000
WALSALL	1,500,000
JERSEY (Extended) (Vertical)	250,000
LIMERICK	1,000,000
DEPTFORD, S.E.	200,000
DUNOON, N.B.	300,000
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ST. ANNES-ON-THE-SEA	500,000

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TURNBRIDGE HUDDERSFIELD.

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THE

"WELSBACH SHADOWLESS"

CYLINDRICAL LANTERN.

EFFICIENT. ELEGANT. ECONOMICAL.

SHADOWLESS AND GENERATIVE.
COMPLETELY WINDPROOF.

BREAKAGE OF GLASS REDUCED TO A MINIMUM.

Hinged top for convenience of Cleaning, &c., with door at bottom for lighting.

Perfect Diffusion.

Glass Cylinders Renewed at Small Cost.

WIDELY USED WITH BRILLIANT SUCCESS ON THE CONTINENT.

STRENGTH AND ELEGANCE COMBINED.

Galvanized Iron Top.
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A Perfect Lantern for thoroughly Economical and Efficient Incandescent Gas Lighting.

VERY MODERATE PRICE HIGHEST POSSIBLE LIGHTING EFFECT.

STRONGLY RECOMMENDED.

Special Prices for Lanterns for 1, 2, and 3 Light Clusters and upwards on application to

The Welsbach Incandescent Gas-Light Co.,

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Public Lighting Department, York Street, Westminster, London, S.W.

METROPOLITAN GAS METERS, LIMITED,

DRY GAS-METER MANUFACTURERS.

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MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

OVER 70 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **Seven Years.**

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment of Gas.

For Prices and full Particulars, apply to

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GASHOLDERS.
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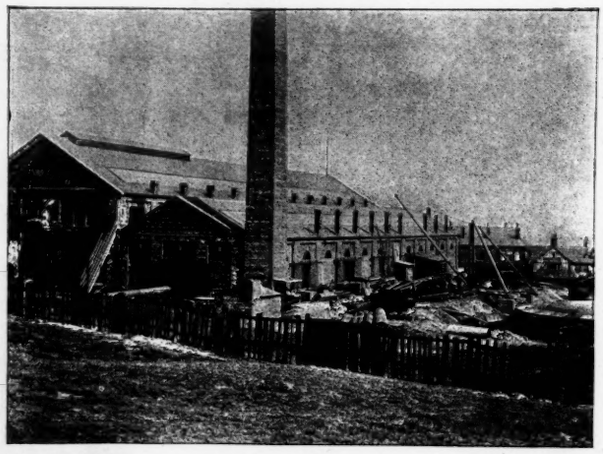

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ROOFS.
BENCH, FURNACE, AND FLOOR IRONWORK.

MOUTHPIECES, WITH SELF-SEALING OR LUTED LIDS.

RETORT-SETTINGS OF EVERY DESCRIPTION.

INCLINED & HORIZONTAL, REGENERATOR, GENERATOR, & DIRECT FIRED.

SHALLOW REGENERATORS A SPECIALITY.

SOLE MAKERS OF HUDSON & RANN'S PATENT AUTOMATIC CHIMNEY DRAUGHT REGULATOR.

CONTRACTORS FOR COMPLETE GAS-WORKS.

R. DEMPSTER & SONS, LD. ELLAND, YORKS.

Telegrams: "DEMPSTER, ELLAND."

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View of Six Purifiers, Superstructure, Roof, &c., erected by R. Dempster & Sons, Ltd. (*From a Photo.*).

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SOLE AGENTS FOR

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—FOR—

ENGLAND, WALES & ABROAD.

RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.

RESULTS GUARANTEED.

OVENDEN HALIFAX

RETORT SETTERS. FURNACE BUILDERS. ETC. ETC.

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

630,000,000

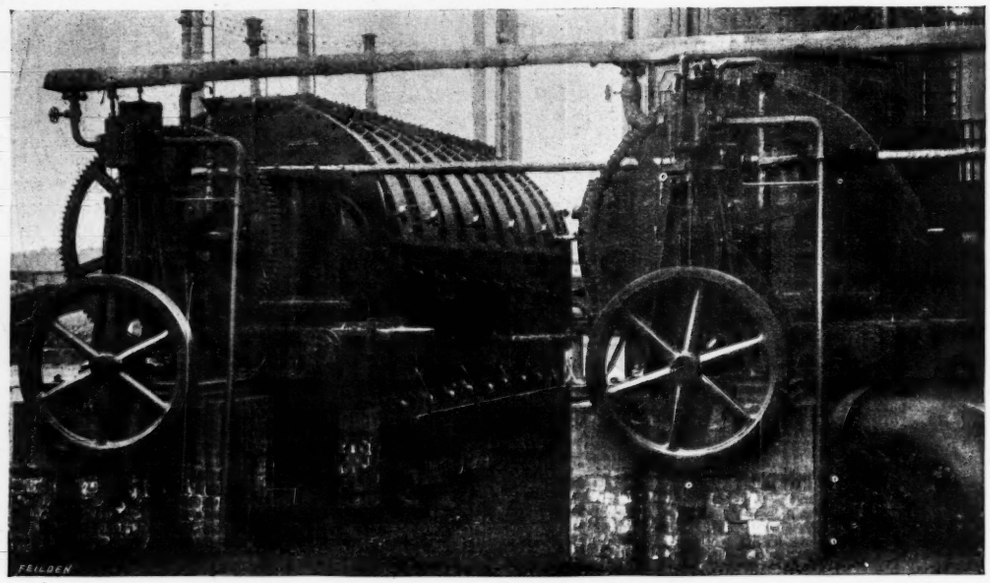
Cubic Feet of Gas per day are now being Purified by

PATENT "STANDARD" WASHER-SCRUBBERS

which extract ALL the Ammonia and a large proportion of the CO_2 and H_2S.

Prevention of Slip of Gas Unwashed

Strength of Liquor Concentrated.



Maximum Washing Surface.

Easy access to interior.

PHOTO. OF MACHINES RECENTLY ERECTED AT THE SCULCOATES WORKS, HULL.

KIRKHAM, HULETT, & CHANDLER, LD.

PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

THE GAS-METER COMPANY,

MANUFACTURERS OF LIMITED.

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM (Late WEST & GREGSON). Established 1830.

For Prices and Particulars apply to

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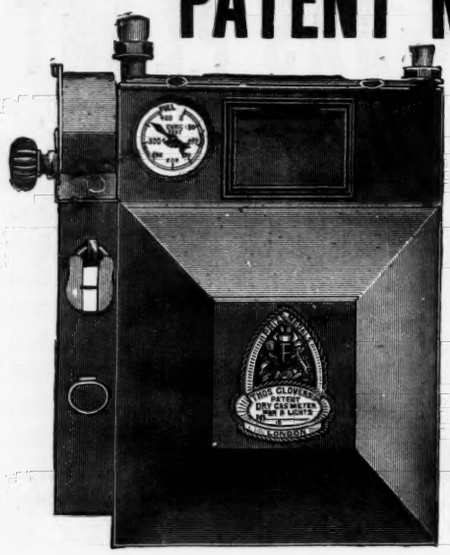

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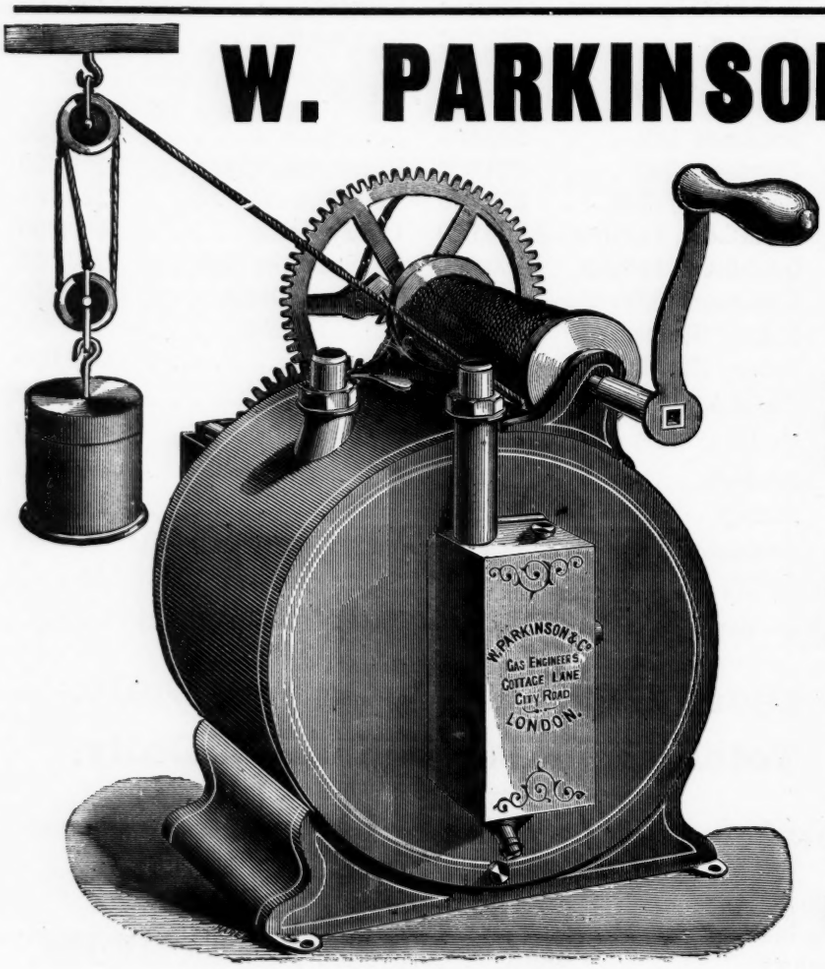

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EDITORIAL NOTES.

In the Interest of Good Public Lighting.

A FORTNIGHT ago, we had occasion to notice in these columns the confusion of the street-lighting arrangements on and in the neighbourhood of Waterloo Bridge, in itself one of the glories of London town. It was then remarked that this lack of uniformity and system in the public lighting of the Metropolis is due to the distribution of the responsibility for providing this service among mutually independent Metropolitan highway authorities. Though, as in the case of the Waterloo lamp-posts, this discontinuity of lighting arrangements has obvious disadvantages, on the other hand the independence of the Metropolitan authorities favours experiment, and saves London from that flat monotony of administrative style which becomes so wearisome in some of the admirably-governed Continental capitals. We speak now of the street lighting itself, not of the lamp-posts. Actually, the Strand Board of Works have literally eclipsed the half-hearted electric arc lighting of Waterloo Bridge by the London County Council, and have redeemed the higgledy-piggledy arrangements of the bridge approaches in this regard by a magnificent new display of high-pressure incandescent lighting at the Strand and Wellington Street crossing. It is with deep satisfaction that we record this victory of common sense and economy over the waning attractions of the electric arc. It is one more sign that the forced fashion of electric lighting for streets has had its day, and that local authorities are once more returning to the ways of truth and soberness in this regard.

The installation in question (the work of Messrs. William Sugg and Co.) is entirely upon lines followed by the firm in previous developments of this order of public lighting. That is to say, the units are triple incandescent clusters, aggregating 1000-candle power actual—not nominal. Six tall refuge lamp-columns, serving the whole area of this most important street crossing, are refitted on this principle; and all the neighbouring lights of every description "pale their ineffectual fires" in comparison with this supreme effort of modern gas engineering. Wherefore it is not to be wondered at that those London Vestries and District Boards of Works which are not bound hand and foot to electricity are already beginning to see for themselves, from this and other examples, that the Berlin and Paris Municipalities had reason in abandoning arc lighting for incandescent gas. We are informed that a very interesting extension of this system is contemplated, if not absolutely decided upon, by another London Vestry of the first rank. Hitherto, the increased-pressure system of incandescent lighting has only been applied to isolated lamps, or groups of lamps, to which the high-pressure gas supply could be conveniently carried from a near installation. A scheme has now been devised for applying the method to the whole area of a West-end parish. This enterprise will require the co-operation of the Vestry and the Gaslight and Coke Company; because the latter will have to undertake the distribution of high-pressure gas from several convenient centres. Thus the "transformer" principle, already made familiar by electric lighting practice, will find its parallel in gas engineering.

This gratifying technical development is given full publicity in these columns, because it really constitutes something of which the British gas industry should be glad and proud. The electric lighting interest will find in it a very serious check, and one which it will be extremely difficult to get over. Because the comparative economical situation of the two methods of improved street lighting stands thus: An electricity supply company with a living to make, and no rate-fund to draw upon, will not contract for street arc lighting for less than £30 to £32 per lamp per annum. And even so, they demand (in London, at any rate) that the contract shall be for 30 years certain, or thereabouts. Now, a 1000-candle power high-pressure gas-light means a consumption of 30 cubic feet of gas per hour to midnight, and afterwards of 10 cubic feet per hour for the lesser lighting effect required in the small hours. Adding the cost of mantles, water, maintenance, lighting, and cleaning, the working expense (with gas at 2s. 8d. per 1000 cubic feet) will not exceed £16 5s. per lamp per annum. Spreading the capital cost of the installation over five years—which is as long as a local authority ought to provide for in this respect—there is an additional annual

charge of about £4 15s. per lamp. Say, altogether, the adoption of the best system of gas lighting known and suitable for street-lamps will not cost more than £21 each per annum for the first five years, after which the installation becomes the property of the authority.

Well, now, knowing this to be no fancy estimate, but the positive fact, what becomes of the sole reservation made on behalf of the electric light for the public lighting of Maidstone by no less an authority—not to say partisan—than Sir W. Preece? In our last week's "Electric Lighting "Notes" it is recorded that Sir W. Preece candidly advised the Corporation of Maidstone to stick to their cheap incandescent gas street lights, as being so much more brilliant, satisfactory, and cheap than any possible incandescent electric lamps. Such an admission, from this quarter, is significant indeed. It goes, of course, farther than he meant; because if it would be impolitic for the Corporation of Maidstone to substitute electric incandescent for gas incandescent lighting, the same course on the part of a private individual would require some excuse. Sir W. Preece did think, however, that there is no question of the advantage of arc lamps. But what has gone before indicates the existence of a very pertinent question indeed in this connection.

So it all comes to this—that the gas industry is armed and equipped at all points for the struggle with "our "friend the enemy." Where the competition is a free and fair one, as between commercial firms doing business upon identical principles, the issue is tolerably clear. Those who prefer electricity to gas will have the former at any cost, if they are able to afford it; and they have a right to exercise their power of choice. But it is otherwise where ratepayers have been deluded into paying for an electric lighting undertaking which cannot maintain itself without assistance from the rates. In such cases, the power of Municipalism is put forth to conceal its own blundering; and there is no fair competition between gas and electricity. If it is one of the chief objections to monopolies that they raise against the people the price of the commodity or the service monopolized, then a municipalized electric lighting service like that of St. Pancras or Poplar is against public policy, because it makes the ratepayers pay twice as much as is needful for that very important necessary of town life, street lighting.

The Results of the American Coal Tests.

In our "Correspondence" columns to-day, we publish the working results of the American coal tests which have been in progress at the works of the South Metropolitan Gas Company for some weeks past, and about which a great deal of anxiety has been evinced—particularly by the Yorkshire press, some of the London papers, and American news agencies. Representatives of these papers have been very persistent in their inquiries at the gas offices in the Old Kent Road since the intelligence was first published that a cargo of American coal had arrived in the Thames for the Company. The tests, however, are now completed; and Mr. C. C. Carpenter will no doubt be pleased to be rid of the liberal attentions of the gentlemen in search of "copy." Gas engineers, too, have been eager to learn the results of this interesting experiment. The information, however, which it is thought advisable to publish (and which only came to hand as we were going to press with this issue of the "Journal") is very meagre; but the average figures given by Mr. Carpenter will perhaps be sufficient to satisfy the gas engineer, though the general public would no doubt like to know something as to Mr. Carpenter's personal views on the chances of American coal in competition with English in gas manufacture. In the figures which he has supplied, no mention is made of the total cost per ton of the American coal delivered on to the works; and, of course, this is a point upon which information would enhance the interest and value of the working results recorded in the letter. Without the figure, a gas engineer will be unable to make a complete comparison with his own working with English coal. At the same time, it does not require any great power of penetration to see that, unless the particular kind of coal upon which the experiments have been made can be delivered on to a gas-works at a price not exceeding that of English coal, it will not pay to bring it here for gas manufacture. But coal is raised in other places abroad, from which the freightage would perhaps not be so great as in the case of the coal which the Company have been testing; and therefore it would not be surprising to hear before long of experiments upon coal mined elsewhere. We do not say we shall hear of them; but there is the possibility. From the present tests, the Company may not have gained anything but knowledge of what can be done with American coal under English conditions of working; but for their action, and for the results which they make public for the first time through our columns, they deserve the thanks of the gas industry.

The Price of Coal.

In last week's issue we were able to give the facts concerning the purchase by the South Metropolitan Company of the balance of their requirements of coal for the year ending March next. As was then remarked, the Company have neither lost nor gained financially by the courageous policy of waiting pursued by the Directors; but the Board have the considerable satisfaction of knowing that they did not, like the general public and the majority of buyers, risk contributing to the "inevitable" by anticipating it. The announcement that the South Metropolitan Directors have had to pay the same price for the 400,000 tons of coal now bought as for the 600,000 tons they contracted for in the spring may, and will, be taken by the market generally as a sign that lower prices in gas coal are not to be looked for this year. That the existing condition of the gas coal market rendered the getting of better terms for the next few months impossible, unless the coalowners had shown themselves mindful of the future as well as of the present, cannot be denied. It will be seen that we have said "the "condition of the gas coal market," because a distinction at present exists between the condition of that and of the coal market generally. Household coal is easier; steam coal is easier; but gas coal, in contrast to the rest, is in full demand. Gas managers, with last winter's experience fresh in their memories, are evidently not disposed to start the coming cold season with short stocks; and an extra maximum fortnight's consumption in store all round means some 700,000 or 800,000 tons to find. Bearing in mind the fact that last April there were roughly no stocks whatever in hand anywhere, the measure of the demand on the gas-coal owners the last few months can be well imagined. The result is, of course, that collieries have no stocks of gas coal; while the current output is taken up at once—the difference between the situation now and twelve months since being that the deficiency in stocks at gas-works has been made good.

In addition to this making-up of stocks, another factor that has tended, and still tends, to keep the market hard, not only in gas-making but in other quality coals, is the increased and increasing exports. When commenting on Mr. Livesey's speech at Horseferry Road early in August, we said: "The most uncertain factor of the situation—one "to which we think Mr. Livesey did not, perhaps, give "adequate importance—is the export trade; and that is, "admittedly, the most difficult to forecast. In our opinion, "the continued heavy shipments to other countries will "prove sufficient to keep the market stiff for some time to "come; so that we do not expect to see it break much this "side of Christmas." Since this was written, the statistics of coal exports for three months, July to September, have been published, and show an increase over the corresponding quarter in 1899 of 549,199 tons—the aggregate for the three months this year being no less than 15,241,061 tons. Such shipments must necessarily have a material effect upon the home market. The returns for the last of the three months unfortunately show no sign of the export trade falling off. The quantity shipped in September was 5,140,708 tons, as against 4,857,270 tons and 4,499,968 tons in the Septembers of last year and of 1898 respectively. Germany and France continue our largest customers—they, together with Holland (through which coal passes to Germany), having taken 2,500,000 tons more in the first nine months of this year than in the same period last year. When it is considered that the shipping price of the coal exported averaged 18s. 5d. last month (as against 10s. 10d. in both the preceding Septembers), it will be seen how great must be the shortage of coal on the Continent—France alone has paid us £4,982,855 for coal this year, as compared with £2,391,755 in 1899—and why prices have not fallen in this country.

Apart, however, from the gas coal and export branches of the trade, the condition and prospects of the coal market are more favourable, and afford good ground for hope that prices will become decidedly more easy as soon as the activity always created by the advent of cold weather shall have come and gone. This activity will, moreover, be

much less marked than formerly, owing to the abnormally heavy purchases made by the public (on the ill-informed advice of a section of the Daily Press) a couple of months ago. Then, it may be remembered, the coal trade papers reported that "the demand for house coal at this time of "the year [that was early in August] has never been so "active since 1872." Our comment was that we would see what the same reports said in two months' time. So we read that, at last Wednesday's market, "the weaker "tone was largely attributed to the plethora of coal now "in London, which is most unusual at this season of the "year. The great railway marshalling stations, such as "Child's Hill, Willesden, and Poplar, were reported to be "absolutely choked up with loaded waggons. . . . The "market was about the most listless experienced for many "months. . . . There was an abundance of sellers, "and few buyers."

The London market is, of course, not a complete index to the state of the trade, as it is largely a house coal as well as an industrial coal market. But if we look farther and examine the prospects in the great coal-using industries other than gas and railway companies—the iron and steel making, the engineering and shipbuilding trades to wit—there are similar grounds for expecting a lowering in the price of coal. From almost every quarter of the iron and steel trades comes the same story of new orders not being received in sufficient abundance to replace those completed, as well as rumours of works shutting down rather than take orders at reduced prices and pay current rates for coal. From the quarterly shipbuilding returns compiled from "Lloyd's Register of Shipping," issued last week, it appears that the tonnage, other than warships, under construction at the end of September was less than at the end of June by 61,305 tons, while showing a decrease of 143,541 tons compared with the end of September, 1899. Moreover, much of the material used in making the ships that are on the stocks for construction will come not from English but American forges. Furthermore, the Board of Trade returns for last month show the exports of iron and steel goods falling not only below the level of 1899, but also below that of 1898. The figures for the September quarter read: Year 1900, 805,029 tons; 1899, 996,910 tons; 1898, 844,967 tons.

Everything, then, points to a reduced consumption of coal by the great metal working and using industries. This, and the increase of output that will accrue from the opening up of new shafts and seams, will undoubtedly in the end much more than counteract the swollen exports, and will bring down the price of coal generally—provided, that is, that no labour or other complications intervene. The coal consumer has been in such bad luck of late that one feels constrained to insert such a saving clause. The continued strike in America is the latest item in the tale of his misfortunes. It is, however, a long lane that has no turning; and we may be sanguine of the corner being turned before the new Century is many weeks old.

The Chairman of the County Council on Gas Questions.

THE first meeting of the London County Council after the holidays is by custom appropriated for the address of the Chairman on the work of the various Committees during the municipal year. It is a good custom, as it refreshes the members' ideas regarding their duties done and undone. Certain of the London newspapers which are not inspired with an overwhelming amount of respect for the London County Council, have a habit of poking fun at these annual performances; declaring them to be mere exercises of the mutual admiration order. It is bad policy, as well as bad manners, to belittle the County Council, and show incivility to the occupant of the chair of this most important body. Rather should those who think that the Council is not what it should be, magnify the dignity of the chairmanship as well as the responsibility attaching to membership, with a view to enhancing the attractiveness of these positions for the best type of citizens. The London of the County Council is "no mean "city;" and if several of the members of this body are unfit for the position, the fault lies with the electorate which allowed them to be put there. It is to the credit of Mr. Dickinson, who addressed the Council last Tuesday, that he ended his official oration with an appeal to the people of this great Metropolis to show a little more self-sacrifice in offering to share in public work. If only more of the right sort of public men would come forward and apply themselves to the work of the Council, there would be less chance for those of the wrong sort. It is, however, a difficult matter to induce Londoners to take their local governing bodies seriously.

Among other topics mentioned by Mr. Dickinson was the past session's experiences of the Public Control Committee in regard to their Portable Photometer Bill. The Chairman recounted how, upon learning from their officers that in 90 per cent. of gas testings by the portable photometer the results showed that the illuminating power of the gas supplied by the London Gas Companies was below the legal standard, while it was quite right at the fixed stations, the Council had deemed it their duty to seek powers to correct the discrepancy. Their idea of the way to do this was to legalize the portable photometer. Parliament did not see the matter in the same light, which seemed to surprise Mr. Dickinson. He told how the Bill of the County Council had been rejected, "on the ground, "he presumed, that the tests might be taken in unsuitable "premises, and therefore be unreliable." But surely, when the question is looked at calmly, and the grounds of the Council's action examined exactly as Mr. Dickinson stated them, is it not at least fair to hold that the proposal to legalize the portable photometer for the reason given was a hasty one?

Who could possibly say that those 90 per cent. results were necessarily right, and the contrary results of testings at the fixed stations wrong? It was not only suspicion of the unreliability of the portable photometer, for the single reason suggested by Mr. Dickinson, that determined the rejection of the Council's proposal. He is evidently aware of this, for he immediately proceeds to state that the Committee have resolved "to ask the Board of Trade to "institute an inquiry, in order to ascertain what was the "true cause of the serious difference in the quality of the "gas when tested at fixed stations and when tested by a "portable photometer." That is quite right and proper; and it would have been better if the same course had been taken before the Committee were so wrongly inspired as to rush into Parliament with their crude, ill-digested scheme of legislation on the subject. The Council would at least not have been made to cut so sorry a figure before that impartial tribunal.

When the Board of Trade are asked to inquire into the "serious difference" between the results of portable and fixed photometer testings, the first step the Department will take (if anything at all is done in the matter) will be to ascertain the existence of the alleged fact. This is one thing that the County Council failed to prove to the satisfaction of Mr. Oldroyd's Committee. Of course, differences were alleged—"chronic" differences, the Chairman of the Committee called them—but the evidence on the point was not convincing. The Board of Trade will not be jockeyed into taking anything for granted. The wisdom of Charles the Second, in the matter of the live fish and the bowl of water, is still a tradition of Whitehall. Government Departments, with no private ends to serve, like to make sure that a thing "is so" before setting about explaining or accounting for it. We should not be surprised if the case for parliamentary action, so rashly adopted as their own by the Council, were to come out of this preliminary inquiry with a different appearance. Mr. Dickinson did not say anything construable into a positive declaration that the Committee would introduce another Portable Photometer Bill next session, but only expressed a harmless hope that the Committee might have a better case next time. They could not well have a worse, or a worse managed one.

Mr. Dickinson's allusions to the other parliamentary work of the session relating to gas supply were of an even more questionable tenour. Thus, with reference to the inquiry held by the Powers of Charge Committee, he asserted that "the Council's case against the Companies "was fully established." One scarcely knows what to make of this general statement. It would be difficult to specify off-hand what was the nature of this "case," and still more difficult to prove how the report of this Committee vindicates the County Council. One of the principal recommendations of the Committee was fiercely attacked by all the London Local Authorities north of the Thames, and was struck out of the only Bill that proposed to make it law. From these and other expressions of the Chairman, it might be inferred that the many preoccupations of the County Council prevent the members generally

from having a comprehensive grasp of the gas questions of the Metropolitan area.

Municipal Collieries.

STUDENTS of municipal politics will certainly be attracted by the report which we publish elsewhere of the acceptance, by a large majority of the Bradford City Council, of a resolution favouring the acquisition and working of Corporation collieries. This is the development of the theoretical view of the subject submitted by Mr. Priestman to the British Association. Mr. Priestman has not had to wait long for his justification. The Bradford City Council have actually gone the length of instructing the Town Clerk to submit to Parliament, in a Bill to be promoted next session, "a "clause empowering the Corporation to become the owners "of, and to work, a colliery or collieries, with power to "borrow the necessary moneys." So it has come at last, and Bradford has rushed in where Glasgow, Manchester, and Leeds still fear to tread. At least the action of Bradford will raise the question of the expediency of municipalizing a coal supply in the most pointed manner, and will set the Committee on Municipal Trading upon a higher plane. Naturally, the inquiry that suggests itself first upon hearing this bit of news is the familiar and inevitable "What next?" We submit, however, that this query will not affect the present issue, because it will be answered with "Wait, and see." One thing at a time. The wedge of municipal trading has been driven so deeply into the trade and industry of the nation, that no *a priori* objections to the principle are of the smallest avail to prevent its going farther. Municipal coal mines, like every other suggestion of the kind, are to be discussed upon the merits. There is no antecedent obstacle to such discussion. At the same time, it is difficult to take the Bradford resolution as meaning sober business. It sounds much like a Trade Union Congress resolution declaring the expediency of nationalizing something or other. Yet, what about that instruction to the Town Clerk?

It would be easy to pile up a formidable array of practical objections to the idea of a municipality acquiring a colliery for its own purposes; but most of them could be met. There must remain two or three serious difficulties in the way of any suggestion of the kind, which can be briefly stated. The first is the obviously opportunist nature of the proof of expediency which has so far prevailed with the Bradford City Council. The only argument that seems to have weighed with them was that the price of coal had recently gone up considerably. True; but the conclusion that therefore the Corporation ought to buy and work a coal mine is a curious *non sequitur*. The price of coal may come down; and where will the argument be then? If the rise in price is a reason for purchasing a mine, would the opposite course of the market prompt its resale? It will be necessary to rest the case on a broader basis. We do not say that such a broad base of expediency does not and cannot exist, but only that nothing of the kind was advanced at Bradford the other day. It is intelligible that, if the Corporation of Bradford could lay hands upon two or three collieries precisely suitable for supplying their requirements, and could show a balance of advantage on the purchase and working of these accessories to their established undertakings, the proof of expediency of municipalization in this regard would be enormously facilitated. Short of this actuality, it is not worth while to ask Parliament to legislate hypothetically.

The Problem of the British Gas Engineering Profession.

COMPLAINTS continually reach the "JOURNAL" office, from all parts of the country, as to the increasing difficulty of finding competent and in all respects suitable men for the higher posts in the national gas industry. It is not merely that in the profession of gas engineering, as in all other callings, "there is plenty of room at the top." The leaders in all walks of life are selected by a combination of influences beyond the power of man to direct. As a matter of fact, there are singularly few men of the very first flight in gas at the present moment; and the knowledge is not comforting to those who have the interest of the industry at heart, and remember the chances and hazards of this mortal life. But apart from the foremost men of their time, it is being borne in upon those who have to do with the appointment of men to really good posts, from which they might aspire to still better things, that the usual "short list" is both very short, and is apt to contain the same names repeatedly. Below this standard again, the proper young men who should make the gas engineers and managers of the future are not coming forward. Whether it is that the electrical profession has superior charms for well-educated youth, or what it is, we cannot say. All we do know—and there is no mistake about it—is that gas engineering does not attract sufficient recruits of the best type. City and Guilds Examinations are no test of the facts in this particular employment market. Of course, there is no lack of the men who are promoted—and worthily—from the ranks. But no army can be satisfactorily officered from this source alone. All important industries want a supply of young blood for the higher ranks—enthusiastic, well-educated young fellows, with the instincts and the training of gentlemen, who have no objection to take their coats off at a pinch and go through the hardest mill like the rest. Where are these, in the British gas industry of to-day? The big undertakings do not encourage them. In fact, the best training is not to be had in the largest works. A small, not very well-equipped gas-works, and a turn at contracting work with a struggling firm, will do more to open a youngster's eyes to the stern realities of life than years of routine existence in a large factory. Are the sons of professional men going through this probation in any number? Doubtful. For lack of it, the future of the industry is being beclouded. This is, really, the darkest spot on the prospects of gas engineering in the United Kingdom. It is so different on the Continent. Young Germans and Frenchmen of good social standing, and adequate equipment, are flocking into the gas industry, with the happiest effect on the tone of technical society. Why is it not the same in England? It is a problem that presses for early and complete solution.

WATER AND SANITARY AFFAIRS.

THE report which Dr. T. E. Thorpe has sent to the Registrar-General, setting forth the results of his chemical analysis and physical examination of the water supplied to the Metropolis, contains a new feature to which it may be well to call attention. When the present Government Analyst took over the work after the death of Sir Edward Frankland, it was considered desirable that some change should be made in the system of collecting the samples of water. It was thought that not only should the number be increased, but that the places from which they were drawn should be more widely distributed. This view was acquiesced in by the Official Water Examiner (Mr. Charles Perrin); and, with the co-operation of the Water Companies, the necessary arrangements were completed. The result of the change is that instead of only one sample per month being drawn from the mains of each Company, twelve or fourteen samples are taken in each case. With regard to the chemical examination of the water, the full monthly analyses which have been customary are continued, but the places from which these particular samples are obtained are varied from time to time. In the case of the remaining samples, the examination is confined to ascertaining the amount of organic pollution and the degree of turbidity of the water—indicating inefficient filtration or disturbance in the mains. The regular monthly analyses are also supplemented by similar determinations. It will thus be seen that the water supply of London is now being subjected to stricter official supervision than hitherto; and it is to be hoped the results may satisfy those who are always ready to grumble at its quality, and profess to believe that the Companies send specially prepared water to the taps resorted by the analysts, and an inferior kind to the consumers. As far as the Companies are concerned, they need not fear the additional tests. During the past two months, 200 samples of water were examined—104 in August, and 96 in September; and the worst that can be said about them seems to be that some contained "minute "quantities" of suspended matter, while others were "opalescent." This is not very alarming.

As the Thames is the source whence more than half the daily supply of water for the Metropolis is being drawn—116,343,545 gallons were taken from the river last month, compared with 103,814,507 gallons furnished by the Lea, wells, and ponds—any measures which tend to its preservation from impurity call for recognition. As far as the upper reaches of the river are concerned, we know that the Thames Conservancy Board are always on the alert to check the discharge of deleterious matter into

the main stream or its tributaries; and in the course of last year the pollution from seventeen towns and villages, representing a population of more than 36,000, was diverted from the latter. Farms, manufactories, private residences, and other scattered premises, were inspected, and pollution prevented in a large number of cases. Though the condition of the lower portion of the Thames is a matter of less vital importance to the Water Companies than that of the section of the stream which is above tidal influence, where their intakes are situated, there is a certain amount of gratification in reflecting that the river is every year improving in character. Evidence of this was afforded by Mr. W. H. Dickinson, the Chairman of the London County Council, in his address to that body, at their re-opening meeting last Tuesday, on the work of the various Committees during the past year. Referring to the Main Drainage Committee, he said they had had to deal with the enormous bulk of 79,382,570,830 gallons of sewage, and to send out to sea 2,288,000 tons of sludge. But although there was an increased quantity of sewage, the maintenance charges were £5000 less than in the preceding twelve months. Moreover, the methods of precipitation were improving; and the water, which formerly had to be carried out to the ocean at great expense, now ran into the Thames at the outfalls—the effluent being highly satisfactory. Proof of the gradual cleansing of the river reached Mr. Dickinson recently from a distinguished naturalist, who had furnished very striking testimony to the fact that eels were increasing in number and size every year, owing in a measure to the enforcement of old laws and the making of new ones, and largely to the example and efforts of the Council. However "fussy" the proceedings of some of the Committees of this body may be, those of the one having control of the main drainage of the Metropolis do not deserve to be thus characterized.

Another Committee of the Council—the one having charge of all matters affecting the public health—has been doing some good work lately, in conjunction with the Medical Officer of Health, Dr. Shirley Murphy (who has had the valuable assistance of Mr. J. Cantlie, M.B.), in making preparations for isolating any cases of plague that may by chance occur in London. According to a report brought up by the Committee at the meeting of the Council last Tuesday, they are at present in a position to accommodate any number of suspected persons up to a thousand. As Dr. Collingridge, the Port Sanitary Officer, and Dr. Sedgwick Saunders, the Medical Officer of Health for the City of London, are keeping a vigilant eye upon the eastern district of the Metropolis, it may be confidently anticipated that any imported case would be promptly detected and dealt with. The recent epidemic in Glasgow was of a mild description; and it is satisfactory to find that it has been completely checked by the medical and sanitary measures practised with so much energy—chief among them being the isolation of the patients and the cleansing or destruction of linen and clothing. Testimony to this is borne by Professor Zabolotny, of the Imperial Institute of Experimental Medicine in St. Petersburg, who has spent several weeks in Glasgow. The system which worked so well in the northern city will be followed in the Metropolis.

The Local Government Board have also been rendering important service in connection with this matter. Early last week they issued to the several sanitary authorities throughout the country copies of memoranda prepared by their Medical Officer, containing suggestions for guarding against the plague, or dealing with any cases which may arise. While doing so, however, they wish it to be clearly understood that their action must not be interpreted as suggesting that in their opinion there is any present cause for alarm. The step they have taken is simply precautionary. The Board point out that the plague must be regarded as personally infective; and they take typhus fever as the type of disease with which it may be best compared. Writing upon this subject in the "JOURNAL" for the 4th ult., we expressed the opinion that plague, like typhus, should be regarded as a "filth" disease, and that accumulation of decaying matter around dwellings, and the consequent saturation of the soil with impurity, accompanied by poverty, overcrowding, and defective ventilation, would be just the conditions likely to cause its propagation. These conditions absent, the principal factors contributing to the spread and permanence of the plague would be wanting.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 970.)

THE Stock Exchange had a thorough disappointment last week. The bright promise of active business and buoyant prices which appeared to be developing so happily in the week preceding received a disagreeable check. Apparently the sole responsible cause for this lay in the Money Market. Other influences had not deteriorated; and there was no change in the general tendency of affairs either at home or abroad. But things grew flatter and flatter; and prices steadily shrank, until at the close there was not a single department that did not show a long array of reductions. The settlement was not heavy, and was easily adjusted. In the Money Market, there was an abundance available for short loans at easy figures; but discount rates hardened materially. A possible rise in the Bank rate on Thursday was discussed; but no change was made. In the Gas Market, as in others, there was some arrest of the activity which had characterized the previous week; and movements in value were not so uniformly in the upward direction as they have recently been. But, though the list is chequered, there is no change of any importance for either the better or the worse. In Gaslight issues, the ordinary was moderately dealt in at very steady figures; the price never ranging outside the limits of 99½ and 100½; and the best figures predominating at the close. Nothing in connection with the secured issues was noticeable. South Metropolitan was quiet; but it grew firmer as the week advanced, and changed hands at top price on Saturday. Nothing was done in Commercials, except a few "special" bargains; but the *ex div.* quotation showed an advance. Some of the Suburban and Provincial Gas Companies were more in evidence than they have been of late. Alliance was a little better *ex div.*; but Brentford preference fell. The Continental contingent were very quiet, but quite firm; and Union had a further advance. Among the remoter undertakings, Buenos Ayres showed the only change—a fractional fall. The Water Companies were rather stronger in general; and several issues effected some modest advances.

The daily operations were: Gas stocks opened on Monday unchanged, and remained firm, with quiet business. Quotations did not vary. In Water, Chelsea rose 2. There was no increase of activity on Tuesday; but prices showed no falling off. Alliance advanced ¼. In Water, East London gained 2, and ditto debenture 1. Wednesday was a busier day, with general firmness. Brentford preference fell 2½. Kent Water rose 2½. Thursday was conspicuous for activity in Gaslight ordinary. Continental Union improved 2; but Brentford preference fell ½, and Buenos Ayres ¼. On Friday and Saturday Gas stocks were quiet, but very firm, and unchanged. On Friday, West Middlesex Water rose 1.

ELECTRIC LIGHTING MEMORANDA.

The Burden of Poplar—The Extravagance of a Poor Vestry—Hoodwinkin the Ratepayers—A Legacy of Loss—Where Electricity Supply does and does not Pay.

OUR latest national epic poem begins with a somewhat harshly expressed adjuration to "drop a shilling" into the tambourine when we have relieved our patriotic feelings by shouting "Rule, Britannia!" It is a counsel that may well be followed in connection with other affairs besides campaigning in South Africa. Notably, it is something to be remembered in regard to the victorious progress of Municipalism, in such matters as electricity supply. After the shouting Progressive, comes the quiet rate-collector with his ever-rising demands. He sees that the ratepayer duly pays up his extra shilling—a good many shillings usually—at a respectful interval after the inauguration of the newest triumph of Municipalism. This is the natural order of things which the owners and occupiers of the parish of Poplar are about to prove in their own experience. Yesterday week, Mr. Sydney Buxton, M.P., formally opened the Poplar Vestry electricity works, by turning on the switch connected with "ten miles" of street arc lamps. He congratulated the Poplar Board of Works on their "enterprise," and hoped that before long few dwellings in the parish would be without the electric light. "He had little doubt that in the end the new works would yield a substantial profit." Mr. Sydney Buxton, for a public man, must be singularly ill-informed in respect of the financial history of parish electric lighting.

After Mr. Buxton, who might have been expected to know better, followed the Chairman of the Board of Works and the Chairman of the Electricity Committee. The former cited Mr. Alfred Blackman, the local Electrical Engineer, as his authority for the promise of a supply of both light and power "at prices considerably lower than those of gas." The parish begin by setting up 195 arc lamps in the first ten miles of streets; and it is proposed to light 17 miles of other streets by electric lamps fixed to the old street lamp posts. The parish will soon learn which kind of lighting is the cheaper. The Chairman expressed the hope that the successors of the present Board will "not rest satisfied till every street within the boundaries is illuminated by electricity." We hope that the speaker will live to see the bill, and be satisfied therewith. Mr. A. H. Valentine, the Chairman of the Electricity Committee, said that a Company, whose offer

to supply electricity to the Poplar district had been rejected, "proposed to charge 7d. per unit for lighting and 5d. per unit for power. The Board's prices were 5d., 4d., and 3d. for lighting, and 3d. and 1½d. for power. Poplar had, therefore, gained at once by doing the work itself." The conclusion is distinctly humorous. There is, we believe, a once popular work of fiction still extant, bearing the title "The Gain of a Loss." No further explanation of this paradox in nomenclature is needed than Mr. Valentine's remark. In what other sense can Poplar be said to have "gained" from the decision of the parish Electricity Supply Committee to sell their product at less than cost price? The Company referred to did not propose to go into the business from motives of philanthropy. On the other hand, their quoted prices for current compare not unfavourably with those of other Metropolitan Companies in the same business which just manage to pay their way. The parish Electricity Committee can, of course, make their prices as low as they please, because they have the rates to fall back upon. The Company would have had no such advantage.

The extravagance of the Vestry is very conspicuous in the circumstance of their starting the parish electricity supply with a public lighting connection of 195 arc lamps. It is the last thing they should have attempted to do, if they had the faintest hope of the undertaking doing legitimate business enough to pay its way. Whatever opinions may be held as to the suitability of the electric arc for street lighting—and opinions differ on this as on other subjects—its costliness is beyond dispute. The time for anything but wilful misrepresentation and self-deception on this head is past. Of course, if Poplar is going to do as St. Pancras, Islington, Hampstead, Shoreditch, and every other "enterprising" local authority similarly situated does—rob Peter to pay Paul—there is no more to be said on the point. The public purse is bottomless. But if the accounts are to be properly kept, they will show that these 195 arc lamps cost not much under £40 per annum apiece. That is paying pretty dearly for the Poplar whistle.

A nice legacy the moribund Poplar District Board of Works are leaving to the new Municipal Corporation! The new local authority will find this out when the echoes of Progressive journalistic applause of the enterprise of their predecessors have died away. It is easy to be enterprising at other people's expense. Mr. Valentine told his Company at the recent opening ceremony that "all was being done without touching the rates. They had borrowed the money from the County Council. The expenditure, so far, was nearly £100,000. In order to attract even poor people, installations in private houses would be made free of charge, and meters with slots for money would be furnished, so that consumers could pay as they went along." To say that a local authority can run into debt to the tune of £100,000 without touching the rates can only be true where the money is applied to the purchase of a remunerative property; and the electricity supply of Poplar will not be that for many years, if ever. And if free wiring for poor people is to be indulged in, somebody else must pay for it. How much longer will this municipal thimble-rigging be tolerated by public opinion?

For it is mere hoodwinking of the ignorant and helpless ratepayers to pretend that municipal electric lighting outside a very few large towns is anything but a dead loss. Look at such a favourable instance of profitable electricity supply as that of Newcastle-upon-Tyne, which is done by a Company, so that the published accounts are trustworthy and complete. The capital outlay here is exactly the same as that of Poplar, £100,000; and the lamp-connections number 64,156 for the past year. The working profit for the twelve months amounted to 8·38 per cent. on the mean capital expended, of which 1·02 per cent. went for depreciation. This Company are able to make a profit out of electricity supplied at less than 4½d. per unit all round. There are few like it in the kingdom. Poplar will want a private connection of the same extent before the venture will pay. On the other hand, there is the example of Kingston-upon-Thames, where municipal electric lighting was to be very profitable. In the "Surrey Comet" for the 6th inst., a letter will be found proving that during the five years of the existence of the Corporation undertaking, there has been a net loss per annum of £1780 on an investment now amounting to £50,000. Nor is there any real prospect of the corner being turned, for not a penny has been provided for depreciation of plant now five years old.

GAS ACTS FOR 1900.

(*Continued from p.* 891.)

THE following Acts, obtained last session by Local Authorities, relate chiefly or in part to gas supply:—

The Falkirk Corporation Gas and Burgh Extension Act authorizes the Town Commissioners to compulsorily acquire additional gas lands and construct new works. The gas capital is to be increased by £80,000. Power of inspection of consumers' covered fittings is granted, without appeal.

The Glastonbury Corporation Gas Act empowers the Corporation to purchase the undertaking of the Glastonbury Gas and Coke Company, Limited. In addition to the price of the property, as ascertained by arbitration under the Lands Clauses Acts, the Company are to receive £625 towards their parliamentary expenses of the session, and £200 towards the winding-up expenses. The Company's officers and servants are to be compensated. It is provided that only one counsel and two expert witnesses on each side are to be engaged on the arbitration. The maximum price is 4s. 6d. per 1000 cubic feet for 15-candle gas; no preference being given to consumers in the borough over outsiders. The test-burner is an argand 24-hole burner, with 7-inch chimney. Four per cent. interest is to be allowed on consumers' prepayments and deposits. The portion of the undertaking in the district of Street may be purchased by the District Council. Consumers' internal fittings which are intended to be covered over are to be subject to inspection by the Corporation, with power of appeal to a Court of Summary Jurisdiction. The sum of £7000 is to be borrowed for gas-works extensions. The sinking fund for the repayment of the original loan capital is to be duly apportioned between Glastonbury and Street according to the revenue arising from gas consumed in the respective areas. In the event of Street purchasing its part of the undertaking, the amount of the sinking fund already apportioned to this portion is to be deducted from the ascertained price. The balance of gas revenue is to be applied in reduction of the price, subject to a charge of 1 per cent. for management, which may go to the Glastonbury district rate fund. Street may have an annual audit of the accounts by a professional accountant.

The Glyncorrwg Urban District Council Gas Act empowers the District Council to supply gas and to acquire their portion of the undertaking of the Llynvi Valley Gas Company. The partition is to cost £3250, and is to embrace all the local gas property except the Gas Company's main in the Great Western Railway tunnel at Cymmer. New gas lands are to be acquired and works erected. The maximum price of 15-candle gas is 5s. per 1000 cubic feet. The rate of interest allowable on consumers' deposits is 3 per cent. The sum of £3500 is allotted for the purchase of the Llynvi property and the costs of the Act, and £7500 for the erection of gas-works, with £500 for working capital. The original gas capital is repayable in 40 years. Any surplus gas profits may go in relief of rates. The agreement for the purchase of the gas-works site is scheduled.

The Morecambe Urban District Council (Gas) Act provides for the transfer to the Council of the undertaking of the Morecambe Gas and Light Company. The transfer is by agreement, the terms of which are scheduled. The purchase price is £141,000. Officers and servants of the Company are protected. As to the distribution of the purchase-money, it is directed that the Board shall prepare a scheme which is to be submitted to the proprietors. If one-fourth of the proprietors present at the stated meeting object to the scheme, a Queen's Counsel is to be called in to arbitrate and settle the matter. The district of supply is defined, and includes several neighbouring places, which are given purchasing powers. The maximum price of 15-candle gas is to be 4s. 6d. for Morecambe and Heysham. Rebates not exceeding 15 per cent. are permitted; notice to this effect being endorsed on every demand note. Consumers' fittings intended to be covered over are subject to inspection, without appeal. The Company receive £500 towards the expenses of winding up. New gas capital to the amount of £40,000 is required. Original gas loans are repayable in 40 years. Surplus gas profits go to the district fund.

The Mountain Ash Water and Gas Act authorizes the Urban District Council, among other things, to borrow £10,000 for gas-works extensions and improvements, repayable in 45 years.

The Ossett Corporation Gas Act authorizes the sale of the undertaking of the Ossett Gas Company, incorporated in 1855, to the Corporation of Ossett, chartered this year. The Corporation are to give to the Company notice to treat within six months after the passing of the Act. The Company are entitled to pay the reasonable costs of opposing the Act and of promoting their own Bill out of their revenue or cash in hand, and also to retain one-half of their reserve fund as it existed on March 14 last. The Manager and Secretary are protected. The Company will receive £225 in respect of winding-up expenses. The undertaking is to be carried on in the ordinary course, as from March 14; but no extraordinary engagements are to be entered into pending the transfer. Unclaimed shares of the purchase-money, if under £500, may be paid into the County Court of Dewsbury. The maximum price of 15-candle gas is 4s. per 1000 cubic feet. For the protection of the Parish Council of Crigglestone, it is enacted that, when the yearly consumption of gas within the parish exceeds 10 million cubic feet, the price is to be the same as within the borough, and is never to be more than 3d. per 1000 cubic feet higher. Three per cent. interest is payable on consumers' deposits, and 4 per cent. on prepaid accounts. Consumers' covered fittings are liable to inspection; but this power must not be exercised beyond the borough without the consent of the Local Authority. There is power of appeal to a Court of Summary Jurisdiction against any order made under this clause; and notice of its existence must be advertised. An agreement with Horbury for sharing the sinking fund is scheduled. Other Local Authorities have purchasing powers, subject to the approval of the Board of Trade. The sum of £25,000 is required for gas-works extensions; all gas loans being repayable in 45 years. Surplus gas profits go to the district fund.

The Walsall Corporation Act appropriates certain Corporation lands for gas purposes. A clause contains the same powers of inspection and prescription of the sizes of consumers' internal fittings as are contained in the Grantham Gas Act—*ante*, p. 890.

Additional gas capital to the amount of £120,000 is required, to be repaid in 40 years.

[Several of the "Omnibus" Corporation Acts of the year contain minor references to gas supply, which will be noticed in connection with the other clauses of these statutes.]

WAGES AND HOURS OF LABOUR IN 1899.

In the tenth month of 1900, we receive the full annual report of the Board of Trade on the changes recorded to have taken place in Rates of Wages and Hours of Labour in 1899, a preliminary and incomplete summary of which appeared in the "Journal" on Jan. 30. The report is, we grant, a monument of industry; but the business office which was not able to compile, or the publisher whose living depended upon his possession of business capabilities, who could not turn out such a work in considerably less than nine months, would be the laughing-stock of the commercial world. However, we must be thankful that the Government "Commercial" Department publishes statistics concerning employers and their workpeople during their lifetime, and does not nurse its reports, as the War Office does its medals, till those interested in them are dead and buried. The year in question was so remarkable for the great revival of trade therein witnessed, and will be so often looked back upon as forming part of a notable period in our industrial history, that the salient facts relating to the state of the labour market during the twelve months may well be rescued from the obscurity of a three hundred page volume of statistics, and noted for future reference, as well as on account of their present interest.

The years 1894 and 1895 marked the depth of the depression in trade which followed the abounding times of 1890-91; wages in those years falling heavily. In 1896-7, the balance of wages, setting increases against decreases, was in favour of the working classes; but the real force of the trade revival was not felt until 1898, when wages rose rapidly and substantially. This rate of increase was maintained and exceeded in 1899, as will be seen from the following statistics.

The net increase of wages in 1897 was £45,000 per week as compared with 1896; in 1898 the increase over the preceding year was £95,000; while in 1899 wages again rose £115,000 a week. Great, however, as was the rise of wages last year, it has been considerably exceeded in the eight months of 1900 which had elapsed before the report of the Board of Trade was completed. The changes recorded during this period have effected nearly a million persons, and have resulted in a net increase of more than £150,000 per week—by far the greatest rise yet recorded in any similar period. The aggregate effect of these rises will be better comprehended if we put it that, in 1899, something like £13,000,000 was paid in wages more than in 1896; and that last month the current rates of pay represented an annual wage bill exceeding that of four years ago by £21,000,000. This increase is not, of course, spread equally over the various classes of workpeople throughout the country. Indeed, the percentage of the industrial population affected is comparatively small, though it has increased considerably during the past two years. Excluding agricultural labourers, seamen, and railway servants (with regard to whom exact statistics cannot be obtained), the number of persons whose wages were changed represented from 7 to 8½ per cent. of the industrial population in each of the five years, 1893-7, but rose to 13 per cent. in 1898, and 15 per cent. in 1899. Only, in fact, in the mining industry did the percentage rise above 20 last year; but of the total number of coal miners employed, no less than 94 per cent. had increased wages.

The rise in miners' wages was, it need hardly be said, the most prominent feature of the changes of wages in 1899, as it was the previous year; that rise last year accounting for nearly half the total increase. The upward movement in those wages during 1900 has been still more striking than in 1899; the total rise in weekly wages in the first eight months of this year being more than twice as great as in the whole of the preceding twelve months. This abnormal rise is, of course, as the report points out, closely connected with the rapid increase in the price of coal, which, though taking place partly in 1899, did not exercise its full effect on wages until the present year, owing to the practice of basing changes of wages on the average price ascertained over a previous period of months. The changes in wages in the coal-mining industry in 1899 were almost entirely general in character; all districts participating in the improvement arising from the increased demand for coal.

Next to the tremendous increase in the earnings of the colliers, the rise in the wages of the men employed in connection with the iron, steel, and engineering trades has been the most noteworthy. The great increase in the selling price of pig iron led to a heavy rise in the wages of the blast-furnace men; the 19,237 hands employed in the manufacture of pig iron receiving increments to their wages equal to nearly 5s. per week. Other workers in iron and steel had their rates of pay increased by over 3s. per week; while in the engineering and the shipbuilding trades the rise only represented 1s. 1d. on each man's wage.

We have already said that the rise in wages, as shown by these returns, was not by any means universal last year. This is strikingly exemplified by the fact that the only recorded changes in the wages of gas workers employed by undertakings other than local authorities are five in number, and affect 371 individuals; while changes in the wages of about 4600 gas workers employed by local authorities are notified. These figures go rather to prove that in regard to private gas undertakings the statistics received by the Board of Trade are not complete, as doubtless the number of men employed by gas companies who obtained increased rates of pay last year considerably exceeded 400. The present is, of course, not a time when gas-workers' wages are likely to be materially raised. Indeed, if, as in such industries as coal mining or iron working, the wages of the hands engaged in gas making were governed by the prosperity of the undertakings, a very considerable decrease would have been made this year therein. Only in the case of the South Metropolitan Company, however, will the hard times for the shareholders be directly felt by the men, who, in consequence of the rise in the price of gas, will receive no profit-sharing bonus.

What makes the impossibility of gas managers giving their hands any higher rates of pay at the present time bear somewhat hardly on the men, is the fact that, on account of the coal "famine" and other various causes, the cost of living is temporarily higher than in recent years. Fuel is dearer, light is dearer, and, worst of all, food is dearer. Rents, too, tend to increase rather than to decline; so that the shilling does not go quite so far as it did two or three years since. But the workman who has the good fortune to be employed by a gas company should bear in mind that, though he may have to forego the plums picked up in times of abnormally good trade by some of his fellows, he has the more than compensating advantage that, when trade is slack, his job is as certain and his wages are as good as ever. Gas-works never have to shut down on account of trade depressions. They, indeed, generally profit by the low cost of coal and materials, and the consequent cheapness of gas, in that they are enabled thereby to secure increased business. What company but is conscious at the present time of the check put upon its expansion by the higher price of gas?

Other companies placed somewhat similarly to gas undertakings as regards the detriment to their prosperity caused by the present state of trade, and the consequent impossibility of acceding to demands from their men for higher pay, are the railway companies. The average wages of railway servants show a slight gradual rise during the past four years; the average weekly wage per head of all employees having increased from 24s. in 1896 to 25s. 3d. in 1899. That the present time, when the companies have enormously heavier coal bills to pay, and no means available for obtaining a correspondingly increased revenue, should have been chosen for a general agitation on the part of railway servants for more wages, shows that their leaders pay no regard to circumstances, and do not give the companies any credit for the advances already granted.

The most striking and satisfactory feature of the report, so far as concerns wages, is that, of the 1,175,576 workpeople (other than agricultural labourers and railway servants) whose wages were changed in 1899, no less than 1,141,303, or 97 per cent., obtained the higher rates by other means than that of a strike. Exactly 50 per cent. obtained their rise by direct negotiation between themselves or their representatives and the employers; 32 per cent. by means of conciliation boards, joint committees, mediation, or arbitration; while 15 per cent. received their increases under the terms of sliding-scales. The percentage of increases obtained after recourse to a strike has fallen steadily since 1896, when it was 9; the figures for 1897 and 1898 being 7 and 5 per cent. respectively. The return for last year, as we have said, only shows 3 per cent.; and even this proportion would have been lower but for the prevalence of strikes for higher wages in the building trade. The fact is, of course, that employers were doing so well that they could better afford to pay more wages than risk a stoppage of production.

The percentage (2·4) of unemployed members of Trade Unions making returns to the Board of Trade in 1899 was lower than in any year since 1890. The statistics for the present year appear to show some diminution in activity of employment, but not as yet to any marked extent; and as, generally speaking, changes in prices and employment precede changes in wages, there is as yet little sign of any check to the upward movement of wages, except perhaps in the Scottish building trades.

As to changes in hours of labour, it may be said that during 1899 an even smaller number of workpeople had their hours reduced than in 1898; but, chiefly owing to some large reductions in the working hours of the employees of public authorities—especially tramway servants in London and Liverpool—the aggregate reduction in hours was greater. In all, 35,949 employees had their time reduced on the average just over 3½ hours per week. The number of workpeople who secured an eight-hour day was not large—being 3316, of whom 2297 were employed by private concerns, and 1019 by public authorities; the latter number including 220 gas workers at Leeds and 160 at Bradford. No reversions from the eight-hour day to longer hours of labour were reported to the Board of Trade.

The death is reported on the 19th of August, in his 54th year, of Dr. A. Heintz, who was the leading authority on the Continent on the manufacture of fire-bricks, &c. After general scientific studies, he became chemist to the Stettin or Didier's Fire-Brick Works in 1873, and thereafter was solely engaged in the fire-clay industry. He was an active member of both the German and the Austrian Associations of Gas and Water Engineers.

DR. HALDANE'S BLOOD TEST FOR CARBONIC OXIDE IN AIR OR GASES.

Passing mention has been made in the "Journal" on several occasions of Dr. John Haldane's blood test for carbonic oxide in air or illuminating gas, and also of a new method of gas analysis designed by Dr. Haldane with a view to work in physiology and hygiene. Papers on these subjects have been published by the author since 1895 in the "Journal of Physiology;" but owing to the inaccessible character of these original publications, Dr. Haldane's work is not so well known as it deserves to be. By the kindness of Dr. Haldane himself, we are now in possession of the text of these papers; and by his desire we proceed to describe his methods and apparatus as fully as is necessary for the information of those who are interested in the matter as a branch of gas and sanitary technics.

It appears that, when Dr. Haldane's attention was first called to cases of poisoning by carbonic oxide, he found no satisfactory method for determining small percentages of this gas in the air. And there was special difficulty when, as almost always happens, marsh gas or other hydrocarbons were present along with the carbonic oxide. He knew that hæmoglobin solutions had been used for the qualitative testing of air for carbonic oxide. Vogel appears to have originated this test, his method involving the use of the spectroscope; and Hempel followed on much the same lines. Dr. Haldane proposed to simplify the test with a view to the attainment of approximate results. He relied upon the fact that when a hæmoglobin solution is well shaken with air containing carbonic oxide, the proportion of the hæmoglobin which finally combines with the carbonic oxide varies with the percentage of carbonic oxide present in the air. Then by determining colorimetrically the proportion of the hæmoglobin which has combined with the carbonic oxide, it is possible to infer the percentage of carbonic oxide originally present. This is practically the whole scheme of the test Dr. Haldane proposes. As the author persevered with its use, he found that it contained the possibility of yielding results of considerable and even unexpected accuracy, when various easily avoidable sources of fallacy were detected and eliminated. He now employs it for determining carbonic oxide in coal gas, in substitution for the older and less satisfactory tests given in the text-books.

It will be better for the adequate comprehension of the method to follow it from the author's first attempts through his own subsequent improvements. The sample of air was collected by sucking two or three litres of the air through a clean and dry bottle of about 100 to 200 cubic centimetres capacity. The bottle was closed by means of a doubly tubulated cork, previously soaked in paraffin. Each piece of glass tubing was securely closed by means of a stopper made of about an inch of rubber tubing, into one end of which a piece of glass rod was fitted. For the determination of the carbonic oxide in the air inside the bottle, about 5 cubic centimetres of a solution of defibrinated ox blood, diluted to $\frac{1}{100}$th with water, were introduced in the following manner: A pipette having been filled with the blood solution, one of the pieces of glass rod was removed while the rubber tubing was compressed, so as to prevent air from passing into the bottle. The end of the pipette was then inserted in the rubber tubing, and the blood solution allowed to flow into the bottle. Sufficient air was then permitted to escape by the other stopper to enable the pipette to empty itself. The pipette was next removed without allowing any air to enter, and the bottle again securely stoppered. Then the bottle was shaken for a period of 10 minutes—a period which subsequent experience extended to 20 minutes—with exclusion of bright light. This ensured the absorption by the hæmoglobin of all the carbonic oxide it was capable of taking up.

The next stage was the removal of the solution by means of a pipette into one of three narrow test-tubes of exactly equal diameter—say $\frac{3}{8}$ or $\frac{1}{2}$ inch—and of at least 12 cubic centimetres capacity. Another of the tubes received exactly 5 cubic centimetres of the original blood solution; and the third was filled with some of the same blood solution which had been shaken up with coal gas to completely saturate it with carbonic oxide. The colours of the solutions in the tubes were then compared. Starting with the original blood solution as the datum, if more than 0·01 per cent. of carbonic oxide had been present in the air in the bottle, the solution that had been shaken up with it would be pinker. If more than 3 per cent. of carbonic oxide had been present, the tint would be sensibly equal to that of the solution saturated with coal gas. An approximate estimate of the amount of degree of saturation might be made by simple comparison of the three tubes. Dr. Haldane developed a quantitative colorimetric test from the same results, by balancing the tints against a carmine solution. He was evidently surprised at first at the delicacy of the qualitative test with hæmoglobin, used in this way; the colorimetric method being far more delicate than the spectroscopic examination practised by his precursors in this line of analysis. He did not then, however, regard it as a very accurate method, owing to the existence of various sources of error. In a later paper this opinion was corrected; the importance of excluding light during the operation having been meanwhile discovered by Dr. Haldane and Dr. J. Lorrain Smith, of Belfast.

We can now pass on to Dr. Haldane's paper of 1898, written after further experience of gas analysis in the course of various investigations into the nature and physiological action of the gases present in the air of mines, wells, railway tunnels, &c. This paper begins with a description of a special apparatus made for the author by Messrs. C. E. Müller and Co., 148, High Holborn, for the rapid and accurate determination of oxygen and carbonic acid in a sample of air. This arrangement has been used for analyzing samples of "blackdamp" from various collieries. The determination of other gases in the sample can, of course, often be effected by means of special ancillary processes. Dr. Haldane commends this apparatus as being exceedingly useful for the examination of air vitiated by respiration, combustion, &c., as the samples may be collected in small bottles of about 100 cubic centimetres capacity. All that is necessary is to suck the air to be examined into the bottle with the help of a short piece of rubber tubing, and then close it at once with a tightly fitting cork coated with paraffin wax. This system was reported upon in 1897 by the Committee of the Board of Trade on Railway Tunnel Ventilation. Is there any public institution that undertakes the testing of samples of air in this way for all comers?

The particular question of testing air and gas for carbonic oxide by the new method does not arise in connection with the former class of air examinations. In a special division of his 1898 paper, however, Dr. Haldane claims that the blood method "has made it possible to determine directly, and with great accuracy, small percentages (from about 0·005 to 0·3 per cent.) of carbonic oxide in air;" and, further, that it can be conveniently employed for roughly determining in a direct manner the percentage of carbonic oxide in coal gas (which must, of course, be first diluted to about $\frac{1}{100}$th with air). Certain improvements and simplifications of the method are then briefly described. The sample is collected in a bottle of 100 to 200 cubic centimetres capacity, in the manner already described. The bottle is then transferred to a basin of solution of defibrinated ox blood, diluted to about $\frac{1}{200}$th, and being held upside down and the cork taken out under the surface, the bottle is tilted so as to allow about 5 cubic centimetres of the air to pass out and be replaced by the solution. The cork is then again inserted, and the bottle wrapped in a cloth so as to exclude the light, and shaken pretty vigorously for 20 minutes. The bottle must be perfectly smooth and clean inside, otherwise the solution may become turbid. A 5 cubic centimetre sample of the original blood solution is now measured off into a test-tube; the solution from the bottle being poured off into a similar one. For quantitative determinations, a previously prepared carmine solution is required. This is made by mixing in a mortar 1 gramme of pure carmine with a few drops of liquor ammonia, and dissolving it in 100 cubic centimetres of glycerine. This solution is preserved, and a standard solution prepared from it when required, by diluting 5 cubic centimetres to 500 cubic centimetres with water. Enough of this standard carmine solution is now added from a graduated burette to the tube of original blood solution to bring its tint up to that of the solution from the bottle. Next, the hæmoglobin of the latter solution is saturated with carbonic oxide, by leading coal gas into the test-tube through an india-rubber tube, quickly closing the mouth of the test-tube with the thumb, and shaking for a few seconds. Carmine solution is now added to the contents of the other test-tube until equality of tint is again established. From the two readings of the burette, the percentage saturation of the hæmoglobin is calculated according to the manner laid down in the paper of 1895. It seems that the author should re-publish this part of his work in a clear form, with the necessary conversion tables, if others are to use the method.

Dr. Haldane meets an obvious objection that the sample of air in a tenth of a litre bottle is very small, by remarking that there is no advantage in using more for the method of testing in question. The amount of carbonic oxide taken up from the air by the dilute blood solution is only a minute fraction of the total quantity present in the bottle. The same air might in fact be used several times over for a determination; or a smaller bottle might be employed without making the results more than very slightly too low. When ox blood is not available, and for a merely qualitative test for the presence of carbonic oxide, all that is necessary is a pricked finger, yielding a large drop of human blood, which could be diluted with about 10 cubic centimetres of water, divided into two portions. Shake half of the solution in a small dry bottle full of the air to be tested, and then compare the colour of the two halves of the solution. When there is more than 0·5 per cent. of carbonic oxide present in the air, or when there is little or no oxygen present, the sample must be suitably diluted to bring it within the scope of the method. Coal gas, for example, would require to be diluted to $\frac{1}{10}$th or $\frac{1}{20}$th with air. This delicacy renders the test exceedingly serviceable for the hygienic examination of air, "since it will detect and estimate percentages of carbonic oxide well under the limit at which there is danger to life. It requires . . . about 0·05 per cent. of carbonic oxide to produce, after several hours, even slight symptoms of poisoning; whereas 0·01 per cent. of carbonic oxide (or 0·2 per cent. of coal gas, or 0·03 per cent. of water-gas or producer gas) may be detected and estimated. Should, however, a still more delicate method be required . . . . if the oxygen were first removed from the air, the delicacy of the hæmoglobin test would be increased by more than twenty times, so that it would be possibleto detect and estimate as little as 0·001 per cent. of carbonic oxide or 0·02 per cent. of coal gas."

THE COAL RESOURCES OF THE UNITED STATES.

The attention of all coal consumers has been drawn of late to the possibility of the United States becoming not only a great coal-using country—it is already by far the biggest coal consumer in the world—but a great coal supply country, exporting on a vast scale to the European, if not to the English, markets. For this reason, and also because she threatens to become a very serious competitor in the metal goods trades, to success in which an ample supply of cheap coal is a necessity, the question of the extent and the probable cost of production of America's coal resources is of interest at the present time. Much valuable information on those points is contained in an article in the current issue of "The Forum," by Mr. Edward S. Meade, entitled "The Coal Supremacy of the United States."

"The most striking facts of the world's commerce of to-day are, perhaps," says Mr. Meade, "the coal famine in Europe and the export trade of the United States. These two facts are closely related. They stand in the relation of cause and effect. The foundation of our (American) cheap production and our large exports is the abundance and cheapness of our coal. The slow growth of the export trade of our rivals is very largely to be explained by the high cost of their fuel. Other important advantages we do, indeed, possess—in our larger use of machinery, more efficient labour, and cheap raw materials But the most important of all our points of commercial superiority, the consideration which assures us a permanent and commanding advantage in foreign trade, is the superabundance of our coal." These sentences might, thirty years ago, and more recently, have been applied to our own country. There can be little doubt of their accuracy as applied to our American competitors at the present time, though it is, perhaps, hardly correct, in view of the trade returns of the past two years, to speak of the "slow growth" of our export trade. It may, moreover, be pointed out that the actual volume of trade is not the only, nor the true, basis of comparison between this country and the States. Owing to the difference in the population of the two countries, the true comparison between their foreign trades is the value thereof per head of population; and on this basis England is still far in front of the United States.

Nevertheless, the growing industrial activity, coupled with the enormous undeveloped resources of that wonderful country across the Atlantic—which is already beginning to find that foreign trade means foreign political complications, as witness the present difficulties in the Far East—constitute a factor in the situation that cannot lightly be disregarded. Of those undeveloped, or rather but slightly developed, resources, coal is by far the most important. "The nation which has the most abundant fuel and the cheapest power will be the commercial monarch of the future, reigning without a rival. That nation," says the writer in "The Forum," "is the United States." Passing by, with a smile, the truly Yankee extravagance of language—"reigning without a rival"—let us see what the facts concerning the coal resources of this "commercial monarch of the future" really are.

The United States have, declares Mr. Meade, "the most abundant, the easiest mined, and the cheapest coal of any nation;" and he gives figures that (if China be excepted from consideration) fully prove the assertion. As to the abundance, the total area of coal lands in Eastern Europe is less than 10,000 square miles, with seams averaging (say) 3 feet in thickness; whereas the coal area at present being developed in the United States is somewhere about 50,000 square miles, in which the seams average from 5 to 6 feet in thickness, while more than twice that area remains as yet untouched. As to being the easiest mined, there can be no question. Firstly, the coal lies in such enormous quantities near the surface that deep mining is practically unknown. Most of the coal "mines" of the United States do not even go below the water-line. In Pennsylvania (the great coal-producing region of America), 52 out of 71 mines are worked by drifts—that is to say, by tunnels running either horizontally or inclining upward so as to be self-draining, and to permit of loaded trucks running out of them by their own weight. Of the remaining 19, the average depth is under 440 feet, or less than that of the shallowest collieries of England—namely, those in Yorkshire, Derbyshire, and Nottinghamshire. In fact, coal is got in America in immense quantities by what is merely quarrying, and is so plentiful close to the surface that only in cases of exceptionally rich seams—such as the mammoth 30-feet vein in Pennsylvania—is it considered worth while to sink shafts more than a few hundred feet below the surface.

Again, another fact conducing to ease of production is that to which reference has already been made—namely, the comparatively great thickness of the seams in the American coal-beds. This enables a much more general use to be made of coal-cutting machines than would be possible in this country, even were the colliers to agree to employ them, which they will not. "At a thickness of 5 feet, the efficiency of coal-cutting machines is marked; and where these can be advantageously used, a maximum saving of 50 per cent. in the primary cost of working can be made." Coal-cutting machines are, in fact, responsible for about 25 per cent. of the whole output in the States, and are being increasingly used. Moreover, the expense of cutting galleries, as expressed in cost per ton of coal got therefrom, varies inversely with the thickness of the seam. "In thin seams the amount of rock which must be removed to get at the coal is greater than in thick seams, where the spaces from which the coal has been taken furnish most of the communications. In thick seams, moreover, the coal can often be broken down directly into the cars without blasting or handling." It follows that the output of coal per miner in the States is much higher than in this or any other European country. The annual output per person employed in the mines in England is about 300 tons, and tends rather to decrease than otherwise. In the United States it has steadily increased, until it is now between 500 and 550 tons.

The result of this great abundance of coal obtainable by such a small expenditure of capital, and at so small a labour cost per ton, is, of course, that the price at the pitmouth in America is materially lower than in Great Britain and Europe. From 1885 to 1894, for which period Mr. Meade gives his figures, the pithead price of coal rose, in Belgium from 6s. 10d. to 7s. 2d., in Germany from 5s. to 6s. 4d., and in Great Britain from 5s. to 6s. 5d.; while in France a slight fall occurred from 9s. 1d. to 8s. 8d. In the United States, on the other hand, the price declined very materially—namely, from 6s. 4d. to 4s. 10d. In 1899, the pit price in England remained the same; but in the United States it had got down to 4s. 5d., or 2s. per ton less than here. At the present time, with miners' wages in this country advancing by leaps and bounds, this difference must be something nearer 5s. than 2s. a ton—a difference not sufficiently great to warrant the fear (or hope) of any considerable quantity of American coal finding its way into the English market, but more than enough to enable that coal to supply foreign markets hitherto held by us.

The difficulty at present in the way of the American coal export trade is one of shipping, both as regards the supply of tonnage and the obtaining of return cargoes. So far as the first point is concerned, it is reported that numbers of vessels are on order especially for the purpose; and as to the latter, of course the world must pay for its coal, and if it buys it from America, more goods must be sent there than at present, and the development of her industries obviously must increase her demands upon the world's markets. "Good Americans when they die go to Paris," someone said. However that may be, an increasing number of them, very much alive, visit both Paris and London every year; and the trade in luxuries for America grows rapidly. Still, a ton of coal scarcely bulks as much as its equivalent value in luxuries; and some more prosaic import trade must spring up to overcome the freight difficulty that lies in the path of world-wide coal exports from the United States.

It may not be without interest to close this article with a quotation from Professor Jevons—

> Our industry will certainly last and grow until our mines are commonly sunk 2000 or 3000, or even 4000 feet deep. But when that time comes, the States of Northern America will still be working coal in the light of day, quarrying it down on the banks of the Ohio, and running it down into boats alongside. The question is, How soon will our mines approach the limit of commercial possibility, and fail to secure us any longer that manufacturing supremacy on which we are learning to be wholly dependent?

That is the question we have repeatedly urged should be made the subject of expert inquiry, and which must be constantly pressed upon the Government. Is not the foregoing quotation a proof of the knowledge and foresight of Jevons? It was his calculations as to our resources and the growth of our consumption of coal that erred, perhaps intentionally, on the side of pessimism.

A REVIEW OF THE ACETYLENE AND CARBIDE INDUSTRIES.*

The German Acetylene Association have done good service to all interested in scientific and technical progress in relation to the acetylene and carbide industries by commissioning three experts to prepare for publication a first annual report thereon. This report is not confined to one year's progress, as subsequent annual issues will be, but covers in a pithy, yet comprehensive, manner the history of acetylene from the first production of carbide on a commercial scale to the present time. The compilers have carried out their task as becomes acetylene experts of high reputation, and have fully justified their selection for it by the Association. The names of Dr. M. Altschul, Dr. Karl Scheel, and Professor J. H. Vogel are well known to those of our readers who have followed the progress of the acetylene industry as recorded in the columns of the "Journal." In the preparation of the chapter on carbide, they have obtained the assistance of Dr. O. Sandmann, of Nuremberg.

Naturally a work produced by the co-operation of authorities lacks the element of individuality which, even in technical treatises, constitutes no small portion of the attractiveness of a book by a capable and competent author. On the other hand, we know that good matter is often spoiled by faulty treatment; for even those who, by common consent, are masters of their special craft or industry, frequently fail in attempts to impart to others, through the medium of a technical treatise, the principles of that craft or industry. They fail generally through want of recognition of the ignorance of many of their readers. He who would be a successful writer on technology, must imagine himself addressing one who may have no previous knowledge of the

* "Jahrbuch für Acetylen und Carbid." Im Auftrage des Deutschen Acetylenvereins, herausgegeben von Dr. M. Altschul, Dr. Karl Scheel, Professor Dr. J. H. Vogel. Band I, Jahrgang 1899. Halle a. S.: Carl Marhold; 1900.

subject, and may be unable to follow a greatly involved or discursive treatment of it. It is often more difficult for a technological writer to recognize what is immaterial, and may be omitted, than to fill page after page with valuable information which only the writer and a few equally well instructed readers would be competent to assimilate. We are disposed to speak thus on this occasion because our words cannot be construed into a personal attack, as has frequently been the case when we have commented on the failure of some new aspirant to the thin ranks of the company of successful technological authors. Our criticisms, if apparently at times unnecessarily severe, have not, we believe, been always fruitless; for a writer of the proper stamp really profits by exposure of his failings. To take an illustration from the great army of contemporary writers of fiction, many have, like Miss Marie Corelli, been impelled to better efforts, which eventually have culminated in the production of a *chef-d'œuvre*, by the scathing comments of their early critics, who recognized and pointed out faults which it would have taken their author years to detect without such aid. In the same manner, the "JOURNAL" criticisms of technical treatises have been prompted solely by a desire to raise the average quality of such works above the very moderate standard to which so many authors seem content to work. Especially have we resented attempts to present indifferent text-books to the public by men of distinction, whose names would have weight with prospective purchasers. A distinguished engineer, physicist, or chemist does not enhance his reputation by putting his name to a more or less slovenly compilation on his special branch of science or art; while he lowers that branch in the estimation of his readers.

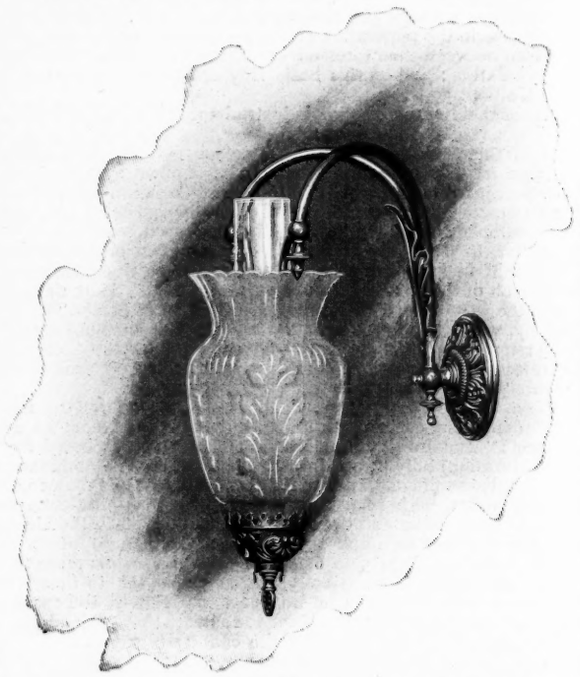
We are glad to say that the unpretentious annual report on acetylene and carbide which is now before us appears to be free from the defects which we consider mar so many of our technical treatises. In the compass of about 200 pages, practically all is said about acetylene and carbide that any student or manufacturer can reasonably expect to find in text-book form. The book is replete with facts, stated briefly; while references to authorities are freely given for the benefit of those who desire fuller information on any points. The text is elucidated by the help of a plate and 136 illustrations. The first 50 pages treat of carbide—its manufacture, properties, cost, and uses. Then 110 pages are devoted specially to acetylene. Its chemical and physical properties, generation from carbide, application to lighting and other purposes, and physiological and sanitary aspects are fully dealt with. Next come about 10 pages of chiefly statistical information, followed by 20 pages of abstracts of German patent specifications relating to acetylene and carbide. These abstracts have been prepared by Dr. J. Ephraim, of Berlin. Owing to the system of supervision exercised by the German Patent Office, they are far more valuable than would be a corresponding compilation from the English patent records. We have not detected any errors of importance in the little work, which we commend to the notice of all who desire to have an up-to-date account of acetylene and carbide, and are able to grapple with the German tongue.

RATIONAL AND ARTISTIC FITTINGS FOR INCANDESCENT GAS LIGHTING.

THE long dark evenings are upon us; and many gas consumers, who as a class are prone to heedlessness in regard to their lighting arrangements while they are little required, will begin to overhaul and improve; and the advice of gas managers will in some cases be sought as to what is the best and latest in gas-fittings. There are signs of a growing taste among consumers for new types of fittings; and no doubt incandescent gas lighting has had a part in producing this change. In these days the cry is for something new in every direction; and gas lighting has not escaped. The old clumsy water-slide chandelier has had its day, and is almost obsolete; the stiff, ugly pipe pendants will soon be known no more, save in kitchens and factories; and the old-fashioned brackets built up of straight pipes with square and round end pieces or simply curved into ~ shape, are fast being supplanted by more artistic productions in the modern house. The marvel is that present-day consumers have put up so long with the same class and character of hideous gas-fittings which did duty in the days of their great grandfathers. But we will not grumble with the past. It suffices for us—and, in fact, it pleases us—to know that a change in fashion has set in; and, having obtained a fair start, the new fashion (as in clothing and other matters) is sure to grow. And to the extent of its growth, the homes of gas consumers will be beautified.

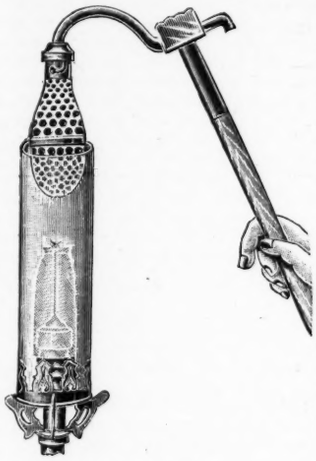
We have said that incandescent gas lighting may have had something to do with the change; and as we look back upon the evolution of the newest styles of fittings, no doubt whatever remains as to its being so. A lighter and different style of fitting altogether was demanded for incandescent gas lighting; and in meeting this demand, the manufacturers tried to raise themselves out of the old grooves, and give to the new goods a more ornate appearance. But for a time they were not wholly successful in producing articles of artistic merit and serviceability, at a reasonable charge; and only within the last year or two has anything come on to the market which, combining those three essentials, has attracted our admiration. Many, too, of the first fittings devised for incandescent gas lighting have not been found to be the best adapted for the purpose. However pretty and bright the fittings, the newness of the parts above the incandescent mantles is quickly destroyed by the products of combustion and heat. They first tarnish, then appear to be burnt, and finally blacken, and quite an incrustation forms. Even a bell suspended above the mantle, or a coronet on the chimney, fails to shield all the surrounding parts—the protectors simply serve to divert the blemishing action. One firm of fittings manufacturers (and others may have done the same) have profited by this experience; and new styles of fittings have lately been brought out in which the main feature is the removal of all brass work from the destructive influence to which we refer. At the same time, the alteration has opened a new outlet for the devising faculties of the producers, and has resulted in the giving to the gas consumer of a good choice of new designs of fittings about which to make complaint one would have to be unreasonably critical.

A catalogue containing some really elegant designs of incandescent gas-fittings of the new character was forwarded to us a few days ago by Messrs. Henry Greene and Sons, Limited, of Farringdon Road; and the illustrations were so pleasing that we have since taken the opportunity of visiting their show-rooms to see the fittings themselves, and were not disappointed in them. The firm have given to the new pendants and brackets the name of the "Simplicitas" fittings. They are made of bronze or polished brass, with a highly clean finish, and are novel and chaste in design. The arms of the pendants and brackets are curved after the style of electroliers; so that the lights depend from, instead of being elevated on, the main part of the fitting. Each arm is formed of a double tube, bifurcating from the stem of the pendant or the plate of the bracket until they attain a spread of about 6½ inches at a point a little above the top of the glass shade. An ornamental junction is made at this point, with two separate descending pipes, which



serve in all the styles the twofold purpose of carrying the burner and chimney and supplying the gas, and in one form supports the glass shade, with the gas-tap underneath. In the other form the shade is supported by two screwed clips at the top; and in this case the gas-tap is situated near the base of the arm. From this brief description, and the representative illustration of one of the brackets, it will be seen that there is no part of the fitting immediately in the course of the upward current from the burner chimney. The pendants are made for two or three lights; and the brackets for single lights. The glass shades are prettily designed and delicately tinted; those supported from the top being of the shape of a vase, 9 or 10 inches in depth, wide at the neck, and tapering to the bottom. The pendants particularly will form effective and handsome centres of light, and will greatly enhance the decorative appearance of rooms in which they are used. The advantages claimed by the firm for these fittings are thus set forth by them: "(1) No brass work above chimney to get discoloured by gas fumes; (2) easy removal of globes for cleaning, without risk of broken chimneys; (3) artistic effect and graceful outline of electrical fittings; (4) position of burner such as to give greatest illumination where the light is wanted, and to be within easy reach." Several new ideas in ordinary fittings were also on view in Messrs. Greene's show-room; and some very tasty designs in polished brass are after the style of hammered iron work.

A little novelty which we came across during the visit is a simple and inexpensive hand gas-lighter; and though it does not come exactly within the four-corners of the subject dealt with here, it has a connection with incandescent gas lighting, and so may be mentioned. The lighting device (which is fixed to a long handle) merely consists of a curved piece of wire hooked at one end for pulling down the chains of incandescent burners so fitted, with a slotted fixture in the centre for turning taps, and with the igniting medium at the other end. This is contained in a pear-shaped perforated metal basket, and consists of pellets of spongy platinum supported by silky looking wire on a small brass frame of ⅂ shape, which is fixed, by the aid of two screws, into the headpiece on the end of the wire. The protecting basket is easily removed for renewing the pellets. The lighter we saw had been in use six months without renewal. It is simply held over the glass or globe; and, on turning on the tap, the current of gas itself heats the platinum, and produces ignition—precisely the same as with the fixed self-igniter to each burner.



PERSONAL.

Mr. Allan Reid, who for a number of years has been Assistant at the Brechin Gas-Works, has been appointed Manager, in succession to Mr. J. B. Terrace, whose resignation was reported in the "Journal" last week.

At the close of the meeting of the Burgh Commissioners of Broughty Ferry last Tuesday, Mr. A. Waddell, who is retiring from the post of Gas Manager, in order to take a similar appointment at Dunfermline, was presented with a gold watch for himself and a gold brooch for Mrs. Waddell.

Mr. W. R. Herring, Engineer to the Edinburgh and Leith Gas Commissioners, has been awarded by the Committee of the Royal Scottish Society of Arts, of Edinburgh, a Macdougall Brisbane prize, of the value of £5, for a paper he read to the Society last winter, on the carbonization of coal for the production of illuminating gas.

The question of the appointment of a successor to Mr. Samuel Stewart as Manager of the Greenock Gas-Works was considered at a special meeting of the Police Board last Thursday. There was a short list of seven candidates; and the final voting took place upon three—Mr. W. Ewing, of Hamilton, Mr. J. M'Nair, of Wishaw, and Mr. W. Mackie, of Port Glasgow. The result was a clear majority in favour of Mr. Ewing.

Our readers will see, by an announcement which appears elsewhere, that the Gas Committee of the Birmingham Corporation are taking steps to fill the vacancy in the secretaryship of the Gas Department which will shortly occur by the retirement of Mr. Edwin Smith, which was announced in the "Journal" for July 24. Mr. Smith has held the appointment since the acquisition of the gas undertaking by the Corporation in 1878; having previously been Secretary to the Midland Institute.

In response to the invitation of the Gas Committee of the Bradford Corporation, which lately appeared in the "Journal," for applications for the position of Assistant Gas Engineer, in succession to Mr. T. H. Duxbury, who has obtained the engineership of the South Shields Gas Company, 45 were received. Last Thursday these were reduced to three; and the Committee finally selected Mr. Andrew Wilson, son of Mr. T. Wilson, of Coatbridge, and formerly Gas Engineer to the Perth Corporation, for the position.

The Construction and Working of Injectors.—In the seven years which have now elapsed since the publication by the Technical Publishing Company, Limited, of Manchester, of Mr. W. W. F. Pullen's work on "The Theory, Construction, and Working of Injectors," several new patterns have been introduced. These have been duly incorporated in the second edition of the book, which has just been issued. The author, who is Professor of Engineering at the South-Western Polytechnic, has brought a great deal of matter into a small compass; and his text is amply illustrated. An interesting portion of the book is the "Historical Summary," which occupies the last 40 pages. In assigning this position to it, the object has been to reserve it till after the theory of the subject had been discussed, and so enable the reader to appreciate the different stages of development. Mr. Pullen does not put forward his work as being anything more than a collection of notes on injectors. But they are those of a careful investigator, and may certainly be consulted with profit by all who seek information on the subject with which they deal.

OBITUARY.

William Sancroft Randall.

We learn, with great regret, of the death, on the 7th inst., at his residence, No. 23, Wellington Road, Old Charlton, after only a week's illness, of Mr. William Sancroft Randall, assistant to the Consulting and Constructing Engineer of the Gaslight and Coke Company, in whose service he had been for 23 years. By his death, the profession of gas engineers loses one of its most gifted and promising members, and the Company an able and zealous servant. Mr. Randall, who was in his 49th year, served his apprenticeship with Messrs. Head, Wrightson, and Co., of Stockton-on-Tees. He subsequently spent some time in the merchant service; but then, abandoning the sea, he obtained an engagement as draughtsman at the Beckton works. Shortly after Mr. G. C. Trewby left Beckton to take up the post of Chief Engineer at Horseferry Road, Mr. Randall was transferred to Westminster, to act as his assistant. The deceased was an associate member of the Institution of Civil Engineers and a member of the Institution of Gas Engineers. His wide culture, genial disposition, and, above all, his sterling worth of character, endeared him to a wide circle of friends. The funeral took place at two o'clock last Wednesday at Mr. Randall's home in Suffolk. A memorial service, held simultaneously at St. Matthew's Church, Westminster, was attended by a large number of his former colleagues.

COMMUNICATED ARTICLES.

THE CONSOLIDATION AND CONVERSION OF GAS COMPANIES' SHARE CAPITAL.

A METHOD OF PROCEDURE.

By A. Canning Williams, of Scarborough.

In the "Journal" for the 2nd of January last* were given the summarized contents of Gas Bills for 1900 promoted by gas companies, and, out of the sixteen Bills named, ten propose to consolidate and convert their existing share capital on a 5 per cent. basis; and there can be little doubt that many other gas companies will, at the first opportunity, seek to obtain similar power. Hence the publication of a set of circulars, &c., suitable, *mutatis mutandis*, for use in schemes of stock-conversion may be deemed appropriate.

We will assume that power has been given to a gas company, under an Act obtained in 1896, to convert its "A" (10 per cent.), "B" (7½ per cent.), and "C" (7 per cent.) ordinary stocks into an equivalent amount of 5 per cent. consolidated ordinary stock, and that the directors of the company have decided, in 1898, to ask the proprietors to give them the necessary sanction to the scheme at a special general meeting to be held at the conclusion of the business of an ordinary general meeting.

Special General Meeting.

Notice of the special meeting, with a proxy form attached, would be sent to each holder of ordinary stock, in these terms—

Important.

Dear Sir or Madam,

I beg to give you notice that a Special General Meeting of the Proprietors of this Company will be held at the Company's Offices on Saturday, the 20th day of August, inst., at the conclusion or adjournment of the business of the Ordinary General Meeting to be held at 11 o'clock in the morning of that day, for the purpose of sanctioning the Conversion of the whole of the Ordinary Stock in the Capital of the Company, issued before the passing of the Gas Act, 1896, into one Consolidated Ordinary Stock bearing a uniform dividend of £5 per cent. per annum, pursuant to Section 4 of that Act.

If you are unable or do no not desire to attend the Meeting, and wish to vote by Proxy at the Meeting, or at any adjournment thereof, please complete the attached Form, in accordance with the directions given thereon, and return the same to me, so that it shall be in my hands not less than forty-eight hours before the time appointed for holding the Meeting.—I am, &c.

In order that the object and effects of the proposed conversion may be made perfectly clear to the stockholders, a slip, showing how the various classes of stock will be treated in the event of the conversion being decided upon, should be attached to the notice of the meeting:—

[In Red Ink.]

MEMO. FOR INFORMATION OF HOLDERS OF ORDINARY STOCK.

Upon the proposed conversion being decided upon and coming into effect, each Proprietor of £100 of 10 per cent. "A" Stock will be entitled

* It should be mentioned that the MS. of Mr. Williams's article has been in our hands for some months; but, owing to the extent of the technical matter which has had to be dealt with during the year, and the consequent pressure upon our space, its publication has been unavoidably postponed. In view, however, of the commencement last week of the notice of the legislation of the past session, which included several conversion schemes, the present has been deemed a fitting time to give our readers the benefit of the experience of one who has been personally engaged in carrying out a financial change of the nature referred to.—Ed. J.G.L.

to £200 of the new 5 per cent. Stock; each Proprietor of £100 of 7½ per cent. "B" Stock will be entitled to £150 of the new 5 per cent. Stock; and each Proprietor of £100 of 7 per cent. "C" Stock will be entitled to £140 of the new 5 per cent. Stock—amounts higher and lower being treated in like manner.

Upon the conversion taking effect, New Certificates will be issued free of charge; but no Stockholder will be entitled to a new Certificate until he shall have delivered up to the Company his existing Certificate (or Certificates) to be cancelled.

No fractional parts of a pound of the proposed new Stock will be registered.

The next matters to claim attention are the resolutions to be put before the meeting—

1.—The Holders of the Ordinary Stock in the Capital of the Company, present in person or by proxy at this Meeting specially convened for the purpose, hereby sanction the conversion of the whole of the Ordinary Stock in the Capital of the Company issued before the passing of the Gas Act, 1896, into an equivalent amount of Consolidated Ordinary Stock bearing a uniform dividend of £5 per cent. per annum, pursuant to Section 4 of the said Act.

2.—That such conversion do take effect at such time not later than the 1st day of January, 1899, as the Directors shall order.

Old Certificates, &c.

The resolutions having been carried, and a schedule of the proprietors of ordinary stock, showing the amounts held by them and their equivalents of the new stock, having been prepared, the next step is to send out requests for the surrender of the old certificates:—

DEAR SIR OR MADAM,

Conversion of Ordinary Stock.

In pursuance of a Resolution of a Special General Meeting of the Proprietors of this Company, held on the 20th of August last, sanctioning the conversion of the whole of the Ordinary Stock in the Capital of the Company issued before the passing of the Gas Act, 1896, into an equivalent amount of 5 per cent. Consolidated Ordinary Stock, I beg to request you to send me, on or before the 21st instant, your Certificate[s] for the undermentioned Stock, in order that a Certificate for the amount of the new Stock to which you are entitled may be issued to you in exchange:—

£ "A" Stock (10 per cent.)
£ "B" Stock (7½ per cent.)
£ "C" Stock (7 per cent.)

I enclose a circular letter, which kindly fill up and return with your Certificate[s] in the accompanying stamped and addressed envelope.

I am, &c.

[Circular Letter Enclosed.]

[Full Postal Address.]

[Date] _____, 1898.

The Secretary of

The Gas Company.

SIR,—In reply to your communication of the I enclose herewith Certificate[s] for the undermentioned Stock:—

£ "A" Stock.
£ "B" Stock.
£ "C" Stock.

Please acknowledge the receipt of the document[s].

Yours faithfully,

_____

The exceptional opportunity for revising the entries in the register of stockholders which a scheme of stock-conversion affords should not be allowed to pass without full advantage being taken of it. Hence, in cases where doubt may exist as to the correctness of the registered descriptions of sole holders, it is advisable that the letter of request for the old certificates should contain an additional paragraph in some such terms as these:—

I may add that your registered description is that of . If this is not now correct, may I ask you to be so good as to insert your present description at the foot of the form enclosed for your reply.

The word "description" should also be added to the form of reply in such instances, thus—

Yours faithfully,

_____

Description _____

Where stock is registered in the names of two or more persons as joint holders, and the correctness of their recorded addresses and descriptions is open to question, it is better to send special forms to the acting parties after the old certificates have been surrendered:—

ACCOUNT [*John Smith, Esq., and others.*]

I enclose herewith a copy of the names, addresses, and descriptions of the registered holders of Stock on the above Account, and, in order to secure accuracy in the new Certificate about to be issued, I shall be much obliged if you will kindly make whatever corrections may be necessary, and return the form to me by an early post.—Thanking you in anticipation of this favour,—I am, &c.

[ENCLOSURE.]

The Gas Company.

Account _____

COPY OF ENTRIES IN REGISTER OF STOCKHOLDERS.			CORRECTIONS.	
Name.	Address.	Description.	Name.	Address.

Date _____ 1898 Signature _____

If no corrections are required, kindly write "No corrections" across the blank columns.

When the corrections are received, it may be found that in some instances the death of a joint holder will be notified, when, of course, proof of death will be necessary before the name is removed from the register.

The forms for acknowledging the receipt of the surrendered certificates may conveniently be bound in book form, and carbon paper used for the purpose of obtaining duplicates of the receipts issued:—

I beg to acknowledge the receipt of Certificate[s] for the undermentioned Stock:—

£ "A" Stock.
£ "B" Stock.
£ "C" Stock.

A certificate for the equivalent amount of 5 per cent. Stock will be forwarded to you in due course.—Yours, &c.

Fractional Parts of a Pound of Stock.

A somewhat troublesome matter in connection with stock-conversion schemes is that which arises out of the fact that the equivalents of the holdings of the converted stock involve, in some instances, fractional parts of a pound. These could, of course, be registered; but to do so would complicate the book-keeping by rendering necessary a shillings column in the register, &c. It is, therefore, in every way advisable to get rid of them by having them all transferred to some person willing to purchase them at their market price:—

DEAR SIR OR MADAM,

Conversion of Stock.

I have to inform you that your _____

_____

[are] equal to £ : : of 5 per cent. Consolidated Ordinary Stock. As, however, fractional parts of a pound of this Stock cannot be registered, the Directors have instructed me to state that the Chairman of the Company is prepared to purchase the whole of the said fractional parts at the price of 125 per cent. I therefore enclose a Transfer Deed for signature and attestation, and shall be much obliged if you will return it at your earliest convenience when I will remit you the sum of £ : : .—I am, &c.

On the transfer deed being returned, duly signed by the transferor and witness, the promised remittance is sent:—

I am in receipt of Transfer Deed duly signed, and now have pleasure in handing you postal order[s] value £ : : , in acknowledgment of which kindly sign and return the enclosed post-card, and oblige.—Yours, &c.

[ENCLOSURE.]

I am in receipt of your letter of the , enclosing postal order[s] value £ : : ; being payment for £ : : of Consolidated Ordinary Stock transferred to the Chairman of your Company.

Signature _____

New Certificates.

The new certificates having been prepared, signed, and sealed, they are dispatched to the stockholders—

DEAR SIR OR MADAM,

Conversion of Stock.

I enclose herewith a Certificate for £ of 5 per cent. Consolidated Ordinary Stock, as per particulars at foot. Kindly acknowledge its receipt by signing the enclosed form, and returning it in the accompanying stamped and addressed envelope.—I am, &c.,

Particulars above referred to:

£ of "A" Stock (10 p. ct.) converted into £
£ of "B" Stock (7½ p. ct.) " " £
£ of "C" Stock (7 p. ct.) " " £
} of 5 per cent. Consolidated Ordinary Stock.

Total amount of Consolidated Ordinary Stock, as per Certificate . . . . £

[ENCLOSURE.]

Received from the Secretary of the Gas Company, Certificate No. , for £ of Consolidated Ordinary Stock.

Signature _____

FLETCHER, RUSSELL, & CO., Ltd.

MANUFACTURERS OF

Gas Cooking Ranges.
Large Ovens.
Confectioners' and Restaurant Ovens.
Carving-Tables.
Hot-Plates for Boiling and Grilling.
Grillers.
Cooking Utensils.
Rapid Water Heaters for Baths.
Smoothing-Irons.
Tailors' Stoves
Tailors' Irons.
Coffee-Roasters.
Boiling-Burners.
Bunsen Burners.
High-Power Burners.
Gas Fires.
Gas Heating Stoves.

Greenhouse Stoves and Boilers.
Taps for Gas Appliances.
Laboratory and Workshop Appliances.
Muffle Furnaces for Gas
Muffle Furnaces for Petroleum Oil.
Crucible Furnaces.
Annealing Furnaces.
Sagger Furnaces.
Tube Furnaces.
Blowpipes.
Foot-Blowers.
Tinman's Bolt Heaters.
Lead Pots for Petroleum Oil.

Brazing Forges.
Soldering Bolts
Ladle Furnaces
Drying and Sterilizing Ovens.
Japanners' Ovens.
Safety Glue Pots.
Gas Governors.

Mantels.
Overmantels.
Coal Ranges.
Register Stoves.
Park Seats.
Theatre Chairs.
Restaurant Tables.
Lavatory Stands,
&c., &c.

SHOW-ROOMS:

134, QUEEN VICTORIA STREET, LONDON, E.C.,

130 & 132, DEANSGATE, MANCHESTER.

WARRINGTON, MANCHESTER, AND LONDON.

Telegrams: "LUMINOSITY, LONDON." ESTABLISHED 1824. Telephone 1215 Holborn.

H. GREENE & SONS, LIMITED,

SPECIALISTS IN GAS LIGHTING,

19, FARRINGDON ROAD, LONDON, E.C.

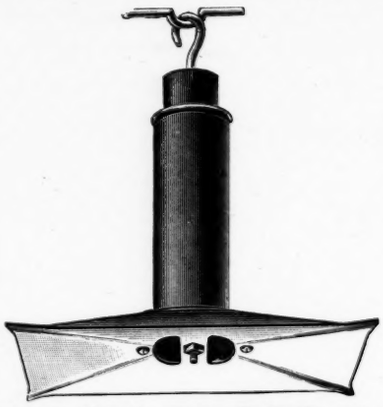
Send for our NEW CATALOGUE of 36 pages of useful Information on PUBLIC LIGHTING, and Illustrations of Lamps which have stood the tests. (*We copy no one.*)

We wish to draw the attention of Public Lighting Authorities to the

PATENT ENAMELLED DEFLECTOR AND CHIMNEY

FOR USE WITH 14-inch AND 16-inch SQUARE LANTERNS.

This Patent Deflector and Chimney converts an ordinary draughty Lantern into a double-chambered Lantern suitable for Incandescent Lighting.



WE HAVE NOW **20,000** IN USE.

H. G. & SONS, Ltd., can convert any ordinary Lantern, of any make, into suitable Lanterns for Incandescent Gas Lighting, and any number of Burners. *See* Notice in "JOURNAL," Oct. 3, 1899.

A NEEDFUL NOTICE

TO ALL WHOM IT MAY CONCERN.

We hereby intimate to Chairmen and Members of Gas Committees, Engineers and Managers of Gas-Works, that we have **PURCHASED THE BUSINESS AND PATENTS OF THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED,** Westminster, London, and are now the Sole Owners of the Patents of the pre-eminently successful system of Self-Acting Conveyors and Elevators in combination with the Storage Hoppers, the Measuring Chambers, and the Charging-Shoots, forming together the much admired and happily-designated "powder-pouch" method of charging Inclined Retorts, now in operation, or in course of erection, at—

Aberdeen,	**Cambridge,**	**Leeds,**	**Nine Elms,**
Batley,	**Chesterfield,**	**Leigh,**	**Rotherham,**
Bow Common,	**Coventry,**	**Manchester,**	**Smethwick,**
Brentford,	**Dewsbury,**	**Middlesbrough,**	**Todmorden,**
Brighouse,	**Dudley,**	**Middleton,**	**Wakefield,**
Burnley,	**Gateshead,**	**Nelson,**	**West Hartlepool,**
Burslem,	**Huddersfield,**	**Newcastle,**	**Wolverhampton.**

PLEASE ADDRESS:

NEW CONVEYOR CO., LTD., SMETHWICK.

PRACTICAL NOTES ON GAS MANUFACTURE.

By S. Carpenter, of East Ham.

(*Continued from p.* 896.)

Ventilation of Purifiers—Revivification of Foul Lime.

By ventilating the purifiers, and at the same time revivifying the foul lime, this material can be employed a second time for the purification of gas, and the nuisance caused when emptying the boxes will be abated. To effect this desirable object, proceed in the following manner: At the bottom of the side of the purifier, just below the first layer of lime, make a communication with a steam-jet exhauster, and connect its outlet to a purifier charged with oxide of iron. When the foul lime purifier is out of action, remove the plug in the cover. After the vessel has been at rest for about an hour, turn on the steam at the exhauster, which will draw the atmospheric air through the foul material, revivify it, and ventilate the purifier. When the exhauster is first set to work, a vacuum of 4-10ths will be sufficient. The cover of the purifier should not be removed until the exhauster has been running for six hours. It should then be raised, and the vacuum increased to 8-10ths. If the vacuum is too great at first, there is danger of raising the temperature to such a height as to fire the grids—a very serious matter. Two gauges should be fixed—one on the inlet and the other on the outlet of the exhauster. The former shows the vacuum, the latter the pressure. It will require about 24 hours to ventilate a purifier.

Lime is a very delicate thing to handle, and great care should be taken in preparing it for its work of removing the carbonic acid and bisulphide of carbon from the gas. It must be neither too wet nor too dry. It should not be sifted, as this would make it too fine, and cause extra pressure. Nor should it be too lumpy; for if it is, the gas will not go through it, but pass round the lumps, and of course leave the inside untouched. Consequently, the two impurities which are specially acted upon by lime will not be effectually removed from the gas. The best way to prepare the lime for taking out these impurities is this: After it has been properly slaked and well mixed, turn it over, and break all the lumps with the shovel. If any are allowed to remain, they should not be larger than a hazel-nut. Care must be taken not to allow any atmospheric air to mix with the lime while it is in use for purification, as this will interfere with its chemical action.

As I have before pointed out, lime is a very useful material for the purification of coal gas, for the reason that it will remove the three principal impurities; whereas oxide of iron is not so serviceable, as it will only take out one—viz., the sulphuretted hydrogen. Oxide of iron not being of an alkaline, but rather of an acid nature, it has no affinity for bisulphide of carbon. The use of lime, however, is attended with great disadvantage—first, on account of its expense; and secondly, because of the nuisance arising from the evolution of the sulphuretted hydrogen during and after the emptying of the purifiers. But this, as already explained, can be prevented by revivifying the foul material before it is removed from the purifier—thus allowing of its use a second time, which will necessarily reduce the cost of purification. A smaller quantity of clean lime will be required in the first place; and there will be less spent lime to be sent away. If purification is carried on in the manner which has been described, it can be done for about 0·7d. per 1000 cubic feet of gas produced.

The efficient purification of coal gas depends upon the employment of means for arresting the ammonia in the first instance. It has been stated that hydrate of lime has a greater affinity for bisulphide of carbon when the gas contains ammonia than when this impurity has been previously removed; also that the ammonia increases the chemical action of the lime. The writer has not found this to be so in practice; but just the opposite. His experience has been that the hydrate of lime never becomes perfectly saturated or neutralized by the carbonic acid and the sulphuretted hydrogen in the gas, but that a large quantity remains in a caustic state. This is in a great measure owing to the fact that so much of the lime being in the form of nodules, the inner portion of them cannot really be brought into contact with the gas without at the same time exposing the outer surface of the sulphide of calcium to the action of the carbonic acid, whereby, of course, decomposition would be induced, and the sulphuretted hydrogen driven from one purifier to another. In order to avoid this, sacrifice of lime is necessary; and the only point requiring attention is to see that it is not carried too far. When the test at the outlet of the first lime purifier shows that the bisulphide of carbon in the gas is as high there as it is in the crude gas, the purifier ought to be at once thrown out of action, and the foul lime revivified before removal from the purifier. When it is taken out, it must be well spread on the floor, when the nodules can be broken up and the material used again.

The writer is inclined to think that the process of purification of gas by dry lime has not hitherto been fully appreciated, or been worked as it deserved. It was the first agent employed for this purpose, and recent experiments, conducted with the most scrupulous care, and by some of the most experienced manufacturers, have shown beyond question that no material is so well adapted for the complete removal of the carbonic acid, bisulphide of carbon, and sulphuretted hydrogen, if atmospheric air is prevented from entering the purifiers containing it. Hence the lime, when fully saturated, or "foul," as it is called, does not contain any of the light-giving constituents of the gas, for they have passed safely through the material. A very different result is witnessed when oxide of iron is employed. This only removes the sulphuretted hydrogen, leaving the carbonic acid and the bisulphide of carbon untouched. It is indispensable that all the carbonic acid should be removed from the gas for two reasons. In the first place, if left in it will deteriorate the illuminating power of the gas; and, in the second, it interferes with the chemical action of the lime for taking out the bisulphide of carbon. All the carbonic acid should be eliminated before the gas enters the second lime purifier, which will act for a while as a sulphide of calcium purifier. When the lime in the first purifier has become so saturated as to be inactive, that vessel must be thrown out of use, and the second purifier made the first, and a clean one put on in place of the second.

Testing for Impurities.

A simple system of testing may be advantageously employed, by which the condition of the lime in each purifier can be ascertained. In the first place, the gas should be tested by lime water twice a day—at the middle and the outlet of the first purifier—for carbonic acid, at the inlet and outlet once a day for bisulphide of carbon, and at the outlet of the second lime purifier for bisulphide of carbon. The condition of the lime in the first purifier, and also approximately of that in the subsequent one, can in this way be known in advance, and the manager be thereby enabled to regulate material in such a way as to obtain steady results. Particular attention should be paid to this matter of testing, as it will keep the manager well posted up as to the impurities contained in the gas. If the ammonia is removed, and the lime and oxide of iron, and also the atmospheric air, are used in the manner described, the gas will be in such a condition as to justify its being called pure.

Taking the Temperature of the Gas.

It is absolutely necessary to frequently take the temperature of the gas as it passes from one apparatus to another, as furnace gas may at times be passing through small holes or chinks in the retorts, and intermixing with the coal gas, which would raise its temperature, and materially interfere with the chemical action of the lime. The writer has found the purification going on satisfactorily, and the sulphur in the gas reduced to 10 or 12 grains in 100 cubic feet, when the following temperatures (taken by him personally at the outlets of the apparatus named) were recorded:—

	Summer. (Air, 68° Fahr.)	Winter. (Air, 40° Fahr.)
Hydraulic main	132° Fahr.	115° Fahr.
Condensers	86° ,,	50° ,,
Scrubbers	88° ,,	47° ,,
First lime purifier	88° ,,	58° ,,
Second ,, ,,	85° ,,	64° ,,
First oxide purifier	76° ,,	52° ,,
Last ,, ,,	70° ,,	42° ,,

(*To be continued.*)

NOTES.

Determining the Hardness of Waters.

Signor G. Venturoli proposes to determine the hardness of a water by precipitating, with an excess of standard sodium carbonate solution, the salts of the earths and alkaline earths which are present, and then titrating back the excess of alkali with standard acid. The following solutions are used: (1) A solution containing 0·429 gramme of anhydrous sodium carbonate per litre (each cubic centimetre of this solution corresponds to 0·00045 gramme of anhydrous calcium chloride). (2) A standard solution of hydrochloric or sulphuric acid of strength corresponding to that of the sodium carbonate solution. (3) A solution of 1 gramme of crystallized ammonium oxalate in 60 c.c. of water. To determine the "total hardness" of a water, 40 c.c. are acidified with hydrochloric acid, evaporated to dryness, the residue dissolved in distilled water, 30 to 60 c.c. of the sodium carbonate solution added, the mixture heated to boiling, and the excess of alkali titrated back with the standard acid. The amount of magnesium salts present is determined by taking 50 c.c. of the water, precipitating the lime by means of 2 c.c. of the ammonium oxalate solution, and then determining the hardness as before in 40 c.c. of the filtrate. The "temporary" and "permanent" hardness of the water are distinguished in the usual manner.

Productions of the German Continental Gas-Fittings Factory.

The brilliant parliamentary ruling of last session, forbidding British statutory gas companies to manufacture gas-fittings for consumers' use, finds a sharp contrast in the manufacturing experience of the German Continental Gas Company, of Dessau. The large factory in this town, where the Company manufacture fittings, not only for themselves, but also for half the gas companies and gas-supplying municipalities of Germany, is continually being enlarged. The management of this branch of the Company's undertaking has just issued a new illustrated catalogue of specialities in gas cooking and heating appliances, the patterns of which are such as experience shows to be appreciated by the gas consumers of different cities. It is the distinctive feature of these manufactures that they realize rather

the gas companies' than the ironmongers' ideal of what is suitable for consumers' use. The Manager, Herr Funcke, draws our special attention to the new pattern of atmospheric burner with which this year's stoves of the Company are being fitted. It is also made separately as a boiling ring, in two sizes, and has the advantage of always producing a sharp blue flame, even when turned low. The new burner is called the "Continental" model. With a gas consumption of 210 litres (7½ cubic feet) of gas per hour, the smaller model brings 2 litres of water to the boil in 15 minutes. The continual production of such novelties shows the benefit of a commercially-spirited Gas Company having such a fittings manufacturing branch attached to it.

The Desulphurization of Coke.

It is remarked by the "Engineer" that it is a somewhat humiliating, but undeniable, fact that in the interval which has elapsed since proposals were first made to desulphurize coke (or, more correctly speaking, to desulphurize coal during the coking process), practically no progress at all has to be recorded. This reflection is inspired by considerations connected with the iron manufacture; but it applies with equal point to the carbonization of coal in gas making. Nobody nowadays appears to think twice of what was at one time so much talked about. As regards the sulphur impurity in furnace coke, it is admitted that there is not much margin of advantage to make desulphurization worth doing. It is nearly 30 years ago that the latest authoritative paper on this subject was written, by M. Philippart, a Belgian engineer, which condemned the various processes of desulphurization then known, as being unsuitable for practical adoption. The great bulk of the sulphur of coal exists in the form of iron pyrites. There is also in coal a certain amount of organic sulphur, says our contemporary, of which nothing is certainly known; and there is supposed to be more occasionally present in the mineral in the form of sulphate of lime or gypsum. The bulk of the sulphur impurity in coal, however, is as pyrites, which contains two atoms of sulphur, and loses one atom during coking. The fixed moiety is diffused throughout the coke, unequally, as ferrous sulphide. The writer refers to the suggestion of liming coal, recognized by Philippart, with the object of converting the pyritous sulphur into sulphate of lime. It is doubted if this intention is often fulfilled, because samples of coke from limed coal have shown the bulk of the sulphur in the usual form of sulphide of iron. The general opinion of engineers on the subject now inclines to the view that no possible chemical treatment of the coal can be adequate, and that the best cure for sulphurous coal is abundant washing. This is because the pyrites is heavier than coal, and can therefore be mostly washed out of it. Further reliable information respecting the whole problem of desulphurizing coal and coke is admittedly desirable, as the best of what is generally available is stale.

Turpentine and its Substitutes.

The high price of oil of turpentine during the past year has had the effect of drawing attention to its peculiar qualities, with the object of procuring some substitute for it in respect of painting work. Dr. W. Lippert declares in a German technical journal, that, whereas chemistry is generally equal to the task of finding equivalents for, or even improvements upon, substances used in the arts for which substitutes are demanded, this has not hitherto been the case with turpentine. Although numerous turpentine substitutes have been proposed and are actually on the market, none of them is the equal of the real thing. On the contrary, they are all so inferior to it that they are virtually nothing but adulterants. Dr. Lippert explains the origin and treatment of turpentine. The crude exudations of various species of conifers are steamed in large stills; the volatile oil being readily carried off, while rosin remains. According to the kind of pine from which the turpentine was taken, the resultant oil of turpentine varies in its qualities, and in its odour. The American and French products are much alike; while the Russian is called pine oil, and cannot be used for mixing with paint as it contains a sticky component which does not dry. There is a vulgar error prevalent that turpentine oil only acts as a "thinner" when added to oil paints and varnishes; but this is not so. Turpentine possesses the property of absorbing oxygen from the air, and yielding it up again to the oxidizable substances —such as linseed oil and gums—with which it is mixed. Hence it materially assists the drying process. The commonest of turpentine substitutes or adulterants are petroleum distillates, chiefly emanating from Belgium, and marketed under the names of "patent turpentine," "turpenteen," "turpentyne," and so forth. These fractions are double-distilled, to remove their distinctive odour. They are very volatile, and it might be thought that they would assist the drying process in paints and varnishes; but this is not the case. If a varnish is thinned with pure turpentine, and also in another sample with benzine, the former will set and dry much quicker than the latter; because petroleum does not absorb atmospheric oxygen. An attempt has been made in Germany to use in place of petroleum the so-called "photogen," a distillation product of the brown coal of Saxony; but it did not answer. A product is being vended under the name of "German oil of turpentine," which is nothing but a mixture of camphor oil and benzine.

The autumn general meeting of the Midland Association of Gas Managers will be held at Birmingham on the 1st prox.

THE INTERNATIONAL GAS CONGRESS.

SYSTEMS OF ILLUMINATION GRAPHICALLY COMPARED.

By Ad. Bouvier, of Lyons.

[A Paper read before the International Gas Congress in Paris.]

The illuminants in present daily use may be compared from two points of view: (1) As to the gas or energy required to produce a given illumination, (say) 1 carcel-hour; and (2) as to the cost of producing 1 carcel-hour. Comparative figures on the basis of (1) hold good in different towns and countries. Those obtained in respect to basis (2) depend upon local conditions. When these latter are known, the figures can be readily calculated from those obtained in (1). Both these comparative statements can be very usefully expressed in graphic form. I will first give the facts to be thus expressed, and then explain how this is done graphically.

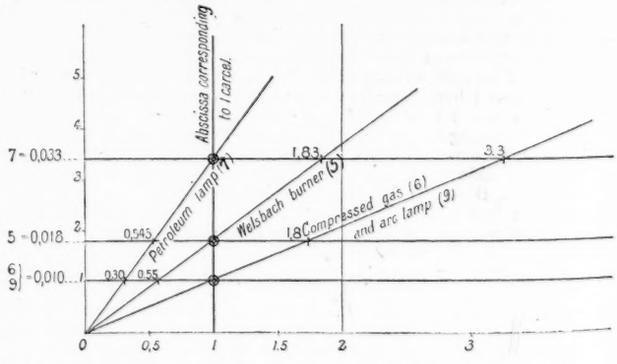
I divide modern illuminants into ten classes, as follows: (1) Gas—batswing burners. (2) Gas—ordinary argand burners, with chimneys—*e.g.*, argand, Bengel, Sugg. (3) Gas—district using 25 per cent. of Welsbach burners and 75 per cent. of various burners. (4) Gas—district using 60 per cent. of Welsbach burners and 40 per cent. of various burners. (5) Gas—Welsbach burners, 1899 model. (6) Incandescent gas under pressure. (7) Burning oil, in ordinary lamps. (8) Electricity—incandescent, models in vogue, June, 1900. (9) Electricity—arc lamps. (10) Acetylene. In regard to Nos. 3 and 4, the average consumption of gas (over the whole town) per carcel-hour will vary according to the burners in use. We may suppose No. 3 to consist of (say) 37·5 per cent. of batswing burners, 22·5 per cent. of argands, and 15 per cent. of Wenham lamps (total, 75 per cent.); and the rest Welsbach burners. Calculation will show the average consumption per carcel-hour to be about 75 litres. On the other hand, a town with 60 per cent. of Welsbach burners will have an average of 50 litres per carcel-hour. We may reduce the efficiencies of these illuminants to a common basis by calculating from the "hourly consumption of a given burner," the "gas or energy consumed per carcel-hour"—denoted by A in the following table:—

Burner or Group of Burners.	Standard Consumption per Hour.	Consumption to Obtain 1 Carcel-Hour.
Gas.		(A)
1.—Hollow-top burner (M. Bouvier, 1888)	0·125 c.m.	0 125 c.m.
2.—Argand burners, with chimney—average (M. Bouvier, 1888)	0·192 ,,	0·090 ,,
3.—District using 75 per cent. of various burners, and 25 per cent. of incandescent burners	..	0·075 ,,
4.—District using 40 per cent. of various burners, and 60 per cent. of incandescent burners	..	0 050 ,,
5.—Welsbach or similar burner, with chimney (average of 1899), pressure not exceeding 30 mm.	0·110 ,,	0·018* ,,
6.—Incandescent lighting with compressed gas	..	0·010† ,,
Petroleum.		
7.—Large and small lamps (taken over several hours)	..	0·033 kilo.
Electricity.		
8.—Incandescent lamps of good quality (MM. Colombo and Hauptmann) .	0·060 K.W.H.	0 0375 K W.H.
9.—Arc lamps (average)	6 to 20 mp.	0·0100 ,,
10.—*Acetylene*	0·050 c.m.	0 0075 c.m.

* Average yield on the consumer's premises with a consumption of 18 litres. This, however, will soon be exceeded in practice.

† This result is nearly attained by various burners. It is sometimes surpassed, as by the "Kugel" light of Herr Salzenberg.

The graphic method of comparing these results is to replace the figures by others calculated so that each of the ten sets of data is successively made the unit. For example, 0·033 kilo. of petroleum being equal to 0·018 cubic metre of gas consumed in



a Welsbach burner, it follows that 1 kilo. of petroleum equals 0·545 cubic metre. Likewise 1 cubic metre of gas in the Welsbach burner equals 1·83 kilos. of petroleum. To set these forth

graphically, two ordinates are laid down at right angles. Along the vertical line there are marked off (using any arbitrary scale) values corresponding to the figures given above—0·010, 0·018, 0·033, and so on. If, now, we draw horizontal lines through each of these points, they will cut a series of perpendiculars (dropped on to the horizontal base-line at equidistant points according to a second arbitrary scale) at certain points. If these be joined at O on the diagram, and the lines thus made produced, we get a series of lines at various angles to the base-line, each of which represents one of the cases under consideration. By following the line of any particular gas up or down, until it meets the horizontal line corresponding to the one with which it is to be compared, its equivalent in terms of the second illuminant is read off on the horizontal scale, starting from the left. For example, we find that 1 kilo. of petroleum equals 0·30 kilowatt-hour consumed in an electric arc lamp, or 0·30 cubic metre of compressed gas; so that 1 cubic metre of compressed gas equals 3·3 kilos. of petroleum.

Coming now to the question of cost, we may take the prices current in Lyons—viz., gas at 20c. per cubic metre, electricity at 75c. per kilowatt-hour, petroleum at 40c. per kilo., and acetylene at 2 frs. per cubic metre. We get the following values:—

Comparison with Lyons Lighting.	Consumption for 1 Carcel-Hour.	Cost of 1 Carcel-Hour in Centimes.
Gas.	(A)	(B)
1.—Flat-flame burner	0·125 c.m.	2·5000
2.—Argand burner	0·090 „	1·8000
3.—District using 75 per cent. of various, and 25 per cent. of incandescent burners	0·075 „	1·5000
4.—District using 40 and 60 per cent. respectively	0·050 „	1·0000
5.—Welsbach burner	0·018 „	0·3600
6.—Incandescent lighting with compressed gas	0·010 „	0·2000
Petroleum.		
7.—Large and small lamps	0·033 kilo.	1·3300
Electricity.		
8.—Incandescent lamps	0·0375 K.W.H.	2·8125
9.—Arc lamps	0·0100 „	0·7500
10.—*Acetylene*	0·0075 c.m.	1·5000

The mathematical principles underlying the treatment of these problems are discussed in the "*Traité de Nomcgraphie*," by M. Mce. d'Ocagne, to which the reader is referred.

It must be mentioned, in conclusion, that the figures given above are true only temporarily. The use of new electric incandescent lamps will, no doubt, render possible a consumption of less than 3·75 watt-hours per decimal candle per hour; arc lighting will likewise reach greater efficiency than 10 watts per decimal candle per hour; petroleum lamps will become more economical, as the incandescence principle is applied to them; while the great improvements which are continually being made in gas-burners and processes will keep this illuminant in a progressive state of efficiency. The graphic method of expressing the relative results will, it is hoped, convince the public that gas can still compete with its many rivals as an efficient and economical illuminant.

THE USE OF HYDROCARBONS AS ILLUMINANTS IN COMPETITION WITH GAS.

By A. Lecomte, of Paris.

[A Paper read before the International Gas Congress at Paris.]

In this paper, I treat of lighting by volatile hydrocarbons, distributed at the ordinary temperature. The liquids used for this purpose are light petroleum, alcohol, and light oils from coal tar, benzene, toluene, and xylene.

The first is an imported product, and is likely to increase in price. [Its possible substitutes among coal-gas products will be mentioned later.] As regards alcohol, legal restrictions oppose its widespread use; but the following properties of the ideal alcohol for the purpose in view may be quoted from M. Vassilière: "It should possess the highest calorific power, should be without action on metals, low in price, and leave no residue when passed through a copper tube surrounded by metallic gauze and heated to 100° C."

Benzene mixes with absolute alcohol in all proportions, and to a lesser extent with alcohol containing water. A mixture can be made at 90° C. of 70 parts of benzene and 30 parts of alcohol (as denaturalized by the Government); but less than this proportion of benzene greatly assists the use of alcohol as an illuminant. Other brands of benzene than the purest can be used. So-called 90 per cent., and even 50 per cent., benzene (the latter containing about 60 per cent. of benzene, 30 to 35 per cent. of toluene, and 5 to 10 per cent. of xylene) gives good results. Other tar oils also dissolve in alcohol, but vaporize with difficulty.

The following table gives the properties of these liquids. The flash-points were determined by the very accurate naphthometer of Parich:—

Combustible Liquid.	Density at 15° C.	Flash Point.	Boiling Point.	Total Heat of Vaporization. Calories.
Alcohol, 100°	793	+14°	78·4°	261
Denaturalized alcohol, 90°	834	+18	77·5	301
Benzene from tar	885	−15	82·0	132
Light mineral oil	680	−17	70·0	153

The next table, by giving the calorific power in two ways—(1) the products of combustion being cooled to 0° C., and (2) the products escaping at 100° C., and containing uncondensed steam—enables the calorific power to be calculated, and also a closer estimate to be made of the results obtained in practice. Experiments have shown me that the ratio of these two calorific numbers expresses what I may call "the useful heat of a fuel," which can be calculated from its calorific power, and the products of combustion escaping at 100° C. with steam uncondensed.

Examination of the table below will explain the behaviour of various liquids. The experiments of Professor Vivian B. Lewes should be studied in connection with it. His researches on the part played by acetylene in flame luminosity explain how it is, for instance, that alcohol vapour has no lighting power. The temperature produced by the flame is not sufficient to bring about the formation of acetylene in the flame. Lewes's experiment may be cited in which a non-luminous alcohol flame deposited no soot when a fragment of porcelain was introduced into it. But on admitting oxygen to the flame, it became luminous, and gave a deposit of carbon on porcelain. On the other hand, water vapour, by lowering the temperature of the flame, reduces its lighting power. These facts, and Lewes's explanation of them, are of great importance in the phenomena we shall now study.

The principal methods of producing light on this system are:—

(1) *Evaporation in the cold*, by causing air to bubble into the liquid, or by a stream of air passing between surfaces moistened with the liquid. (Van Vriesland system, used by La Compagnie Française du Gaz Aérogène.)

(2) *Automatic evaporation in the cold*, by drawing off a mixture of air and vapour. (Adopted by La Compagnie Parisienne des Fontaines à Gaz.)

(3) *Vaporization by heat.* The liquid is converted into superheated vapour before admission to the flame. The superheated vapour takes air with it, and produces a flame, as in ordinary gas lighting. (Alcohol-burner system.)

Method No. 1 requires a fixed installation; Nos. 2 and 3 are portable.

(1) When the compressed air is carburetted by bubbling through the liquid, a diminution of pressure takes place equal to the depth of liquid over the orifices of the air-outlet, which must be made up of minute holes. Large bubbles get carburetted only on the outside. When absorbing substances such as felt, sponge, gauze, or simply metal plates are used, the diminution which then occurs is due, not to the apparatus, but to other causes—of which later. In the Van Vriesland plant, a rotating worm imprisons a certain volume of air at each revolution, and carries it on to the other end of the apparatus in contact with the moistened surface. The proportion of vapour taken up depends on the tension of the vapour, the temperatures of the entering air, the liquid introduced, the external atmosphere, the volume and chemical properties of the liquid, and the hourly make of the machine. When these factors are constant, the gaseous product will be uniform.

Liquid.	Percentage of			Density.	Calories per Kilogramme.		Calories per Litre.		Ratio at 100°.
					Products of Combustion at		Products of Combustion at		
	C.	H.	O.		0°	100°	0°	100°	at 0°
Light petroleum	84·30	15·70	..	·680	12,168	11,210	8260	7620	·921
Benzene	92·30	7·70	..	·885	10,090	9,565	8930	8460	·948
Toluene	91·30	8·70	..	·875	10,350	9,775	9060	8550	·944
Xylene	90·60	9·40	..	·865	10,540	9,915	9130	8580	·940
Alcohol, 100°	52·20	13·00	34·80	·793	7,170	6,372	5690	5060	·905
„ 90°	47·00	12·81	40·19	·833	6,170	5,381	5140	4480	·871
„ denaturalized 90°	41·50	13 00	45·50	·830	5,850	5,079	4850	4215	·868
							Cub. Metre.	Cub. Metre.	
Coal gas (Paris type)	56·85	24·60	8·55	·400	12,640	11,177	6577	5789	·882

(2) This method goes back to the "Gazo-Lampe" of Mille, which differs but slightly from the modern model first made by La Compagnie Parisienne des Fontaines à Gaz. The former consisted of a rectangular cylindrical vessel containing an inner chamber loosely filled with some absorbent, such as coke or pumice. Light petroleum oil is so used that it saturates the absorbent, without any of it remaining unabsorbed in the apparatus. The air is admitted directly to the inner vessel.

The successor of this model is a rectangular chamber (10 litres capacity), containing *papier mâché* or wood pulp; but this has been lately superseded by the so-called "*Bidon à Sondage*." Here the vessel is charged with absorbent pulp. It is fitted with a central tube, which admits the gas and allows it to be forced down into the interior. The air enters at the top of the vessel, the gauging-rod is lowered a little, and the gas led into a new layer as exhaustion goes on. The air is compelled to traverse the old layers (exhausting them) before reaching a fresh one, and entering the gauging-rod. It afterwards passes to the supply-pipes. If compressed air is used, the gas can supply incandescent burners; if for use only with ordinary burners, it can be placed in the same room as the burners, and goes on making air-gas quite uniformly and automatically. Very large pipes are necessary, since the pressure is only 2 mm. at 3 metres height.

I now pass on to cite some results of mine in the evaporation of combustible hydrocarbons in the cold. To make the conditions as practical as possible, I used a Lecomte water-motor, giving a constant air pressure of about 0·2 metre. The air was controlled by an experimental meter. In its exit thence, it traversed a bottle with three tubulures, in one of which a thermometer was held by an india-rubber bung. On its exit from the bottle, it entered a carburettor constructed thus: A chamber of thin sheet iron—containing 1·6 litres, with a total outside surface of 8·8 square decimetres, and giving a surface of liquid of 2 square decimetres—was fitted with a horizontal air-supply tube closed at one end under the liquid, and pierced with a large number of small holes in the two sides. The current of air thus kept the liquid in constant agitation, and prevented it from settling into layers of different densities. As the bubbles were minute, very complete carburation took place. Two thermometers in the carburettor (one in the liquid, the other above it) registered the temperatures.

Liquid.*	Density at 15°.	Time.	Litres of Air.	Weight Taken Up.	Weight Taken Up per Cubic Metre.	Temperature of Air at Inlet.	Temperature of Liquid.	Temperature of Air at Inlet.	Percentage of Total Liquid Evaporated.	Calorific Power at 100° per Cubic Metre.
		min.				Deg.	Deg.	Deg.		
A.	682	..	..	..	..	21·0	19·0	19·5	..	..
		11·0	94	80	850·0	21·0	9·0	10·0	19·1	9,523
		15·0	125	50	400·0	22·0	8·0	9 0	31·0	4,480
		7·0	62	20	320·0	22·0	8·0	9·0	35·7	3,585
		13·0	119	30	250·0	21·5	8·5	9·5	43·0	2,800
		12·0	126	30	238·0	21·5	9·0	9·5	50·0	2,670
		14·0	133	30	222·0	21·0	9·0	10·0	57·0	2,485
		15·0	149	30	201·0	21·0	9·5	10·5	64·2	2,250
	704	17·0	177	30	169·0	21·0	9·5	10·5	71·3	1,895
B.	872	..	..	..	..	20·0	19 5	20 0	..	..
		6·0	53	10	189·0	20·0	16·0	16·0	2·5	1,808
		6·0	54	10	185·0	20·0	14·0	14·0	5·0	1,770
		5·5	54	10	185·0	20·0	12·5	12·5	7·5	1,770
		6·0	55	10	182·0	20·5	11·5	11·5	10·0	1,740
		6·0	57	10	175·0	20·5	11·5	11·5	12·5	1,672
		6·5	61	10	164·0	21·0	10·5	10·5	15·0	1,568
		7·0	61	10	164·0	21·0	10·0	10·0	17·5	1,568
		7·5	67	10	149·0	21·0	10·0	10 0	20·0	1,425
		7·0	69	10	145·0	21·0	10·0	10·0	22·5	1,385
		14·0	139	20	144·0	21·0	10·0	10·0	27·5	1,375
		14·0	141	20	141·0	21·0	10·0	10·0	32·5	1,350
		20·0	218	30	137·5	21·0	10·0	10·0	40·0	1,315
	874	22·0	222	30	135·0	21·0	10·0	10·0	47·5	1,290
C.	829	..	..	..	..	20·0	21·0	21·0	..	..
		15·0	164	10	66 6	20·0	16·0	16·5	2·0	337
		20·0	193	10	52·0	19·0	15 0	15·0	4·0	264
		21·0	228	10	43·7	19·0	14 0	14·5	6·0	222
		49·0	458	20	43·6	19·0	13·5	14·0	10·0	221
		49·0	462	20	43·2	19·0	13·0	13·5	14·0	219
		50·5	462	20	43·2	19·0	13·5	13·5	18·0	219
	838	50·0	464	20	43·1	19·0	13·5	14·0	22·0	218
D.	847	..	..	..	..	16·0	12·5	15·0	..	..
		6·0	52	10	192·0	16·0	10·5	11·0	2·0	1,200
		6·0	52	10	192·0	16·0	8·5	9·5	4·0	1,200
		6·0	53	10	188·0	16·0	7·75	8·75	6·0	1,175
		6·5	61	10	164·0	16·0	7·0	7·5	8·0	1,025
		6·5	67	10	149·0	16·0	6·5	7·2	10·0	930
		12·5	136	20	147·0	16·0	6·0	7·2	14·0	920
		13·0	138	20	145·0	16·0	6·0	7·0	18·0	910
		13·0	138	20	145·0	16·0	6 0	7 0	22 0	910
		12·5	138	20	145·0	16 0	5·5	7·0	26·0	910
		13·0	140	20	143 0	16·0	5·5	7 0	30·0	895
		19·5	209	30	143·5	16·0	5·5	7 0	36·0	895
	851	20·0	211	30	142·0	16·0	5·5	7·0	42·0	890
E.	775	..	..	..	..	16·0	15·0	15·0	..	..
		4·0	32	15	468·0	16·0	9·0	10·0	3·2	3,720
		3·5	34	10	294·0	16·0	8·0	10·0	5·3	2,350
		3·5	36	10	277·0	16·0	6·5	8·0	7·4	2,200
		4·0	41	10	244·0	16 0	5·0	7·0	8·5	1,950
		10·0	89	20	225·0	16·0	4·0	6·0	13·8	1,790
		10 0	100	20	200·0	16·0	3·5	5 0	18·0	1,595
		10·0	103	20	194·0	16·0	3 5	5·0	22·5	1,540
		10·5	102	20	196·0	16·0	3·7	5 5	26·5	1,560
		10·5	106	20	189 0	16·0	4·0	5·5	31·0	1,500
		11·0	111	20	180·0	16·0	4·0	5·5	35·0	1 435
		16·5	170	30	176·5	16·0	4·0	5·5	41·5	1,400
		16·5	172	30	174·5	16·0	4·5	5 5	47·8	1.390
		16·5	177	30	170·0	16·0	5·0	6·0	54·2	1.355
	800	17·0	183	30	161·0	16·0	5·0	6·2	60·5	1,300

A. Light petroleum. B. Benzene from tar. C. Mineralized alcohol (90°). D. Equal parts of benzene and mineralized alcohol. E. Equal parts of light petroleum and benzene.

From the tri-tubulated bottle above mentioned, the gas could be led also to four burners, in which a trial combustion of the gas was made. The carburettor was placed on a sensitive balance, and the temperature, volume, and speed of the air used was also noted. The experiments went on until the gas became too poor to burn. The density of the liquid was noted before and afterwards. The foregoing table gives the results.

From the figures shown the heat obtainable per hour from a given quantity of liquid can be found. The heat of vaporization may be divided into three parts: (1) That supplied by the liquid itself in cooling. (This is soon exhausted.) (2) That obtained from the air. (3) That from the external air transmitted through the walls of the apparatus. Of these three, the last is the greatest, and is greater in proportion to the difference in temperature between the liquid and the external air. A current of air is thus set up around the apparatus; and as the temperature of the vessel is below the condensation point of the surrounding air, continuous condensation of water is produced, similar to that occurring on a carafe containing cold water in a room. The heat liberated by the water in its return to the liquid state largely maintains the temperature of the apparatus. The following table is an example of the calculations which can be made. It is based on the figures obtained in the first five experiments on mineral oil in the earlier table:—

Time.	Air (Litres per Hour).	Liquid Evaporated per Hour.	Liquid Evaporated per Square Decimetre of Exterior Surface.	Calories per Hour.				
				Total.	From the Liquid.	From the Air Carburetted.	From the External Surface.	Per Square Decimetre of External Surface.
Min.		Grams.						
11	512	436	49·5	66 50	9·40	1·42	56·00	5·36
15	500	200	22·7	30·25	0·52	1·88	27·95	3 16
7	530	172	19 5	26·20	..	1·97	24 23	2·76
13	550	138	15·7	21·20	..	1 89	19 31	2·16
12	625	150	17 0	22 95	..	2·00	20·95	2·38

The heat derived from the walls is seen to be relatively enormous. Certainly the vessel is only 0·3 mm. thick; but I consider the result is due to the condensation changes mentioned above.

The progress of the experiments referred to in the table can be equally well shown by curves. It is found that the curve of light petroleum is the steepest; that of benzene almost a straight line; while a mixture of equal parts of the two gives a curve which just falls below that of light petroleum, and becomes afterwards almost horizontal. The alcohol curve is very regular. It is curious that a mixture of alcohol and benzene shows almost like benzene alone. This is worth notice in the application to gas enrichment of benzene mixed with a little alcohol—the former to furnish the lighting power, and the latter as a solvent of naphthalene.

Even when the conditions for a uniform gas (see above) are fulfilled, an evaporation carburettor can never give a perfect result. The water vapour of the atmosphere dissolves in the liquid, which becomes heavier. During the winter (10° to 12° C.), I have collected, on the wooden barrels containing mineral oil of about ·700 specific gravity, a kind of white deposit resembling sal-ammoniac. Placed in a dish and warmed, it melted and yielded water and mineral oil—about four-fifths water, and one-fifth oil.

These laboratory results may be compared with the figures obtained in practice by MM. de Perrodil and de Morsier, who state: "Assuming the carburettor to be at 5° C., the dilution would be 5640 litres of air for 1 litre of gasoline; at 10°, this figure falls to 4230 litres; and at 15° to 3280." Comparison of these figures with my own, shows that carburetting by bubbling is much more efficient than the surface method; for my figures are higher, though the oil was heavier.

I do not agree with certain other opinions of MM. de Perrodil and de Morsier, and maintain that air gas costs more than coal gas (for equal illumination); that it heats less; and it is of variable composition. On the other hand, air gas is capable of being installed with all the advantages of coal gas as regards convenience in use—a feature, as I show below, that does not distinguish lamps consuming liquid hydrocarbons, which must be heated before use, but are otherwise very economical.

As regards photometric tests of air gas, the table which follows gives the results of my experiments. The last line has been calculated on the assumption that the Dellwik-Fleischer process requires 90 grammes of benzene per cubic metre of water gas

Diluent.	Combustible.	Absorbed per Cubic Metre.	Calories per Cubic Metre (Steam not Condensed).	Percentage Composition. C.	H.	O.	N.	Burner.	Carcels.	Litres per Hour.	Litres per Carcel-Hour.	Hydrocarbon. Grammes per Carcel-Hour.	Calories per Carcel Hour.	Grammes of Carbon per Carcel-Hour.
Air . .	Petroleum spirit	765	8,570	648	117·0	244	956	Bengel	1·00	51	51·0	39·00	436·0	33·00
	..	..	..	..	..	..	..	Bunsen Lecomte, No. 2 .	7·80	92	11·8	9·00	101·0	7·65
„	Benzene	465	4,440	430	35·0	244	956	Bengel	1·00	88	88·0	41·00	392·0	38·00
	..	..	..	..	..	..	..	Bunsen Lecomte, No. 2 .	6·60	175	26·6	12·30	117·0	11·40
Hydrogen	Nil	nil	2 380	..	83·7	..	..	„ „ „ .	6·80	158	23·2	..	55·2	..
	..	..	..	..	..	..	..	„ „ „ .	8·40	210	25·0	..	59·5	..
	..	..	..	..	..	..	..	„ „ „ .	10·00	300	30·0	..	71·5	..
„	Petroleum spirit	850	11,880	718	215·7	..	..	Bray's 000.	1·20	39	32·5	27·60	387·5	23·30
	..	..	..	..	..	..	..	„ No. 1	1·90	52	27·4	23·20	325·1	19·60
	..	..	..	..	..	..	..	Manchester steatite (2 slits)	3·15	82	25·6	21·70	305·0	18·40
„	Benzene	517	7,330	478	122·7	..	..	Bray's 000.	1·00	44	44·0	22·70	360·0	21·00
	..	..	..	..	..	..	..	„ No. 1	2·50	100	40·0	20·70	327 5	19·20
	..	..	..	..	..	..	..	Manchester steatite (2 slits)	1·60	63	39·4	20·40	323·0	18·80
Gas . .	Petroleum spirit	1100	17,670	1203	291·0	41	48	Bray's 000	1·40	45	32·1	35·30	560·0	38·30
	..	..	..	..	..	..	..	„ No. 1	3·80	102	28·8	31·70	509·0	34·30
	..	..	..	..	..	..	..	Manchester steatite (2 slits)	4·50	140	31·0	34·10	548·0	36·90
„	Benzene	640	11,490	864	167·0	41	48	Bray's 000	1·60	70	43·7	28·00	503·0	37·60
	..	..	..	..	..	..	..	„ No. 1	5·00	158	31·5	20·40	364·0	27·10
	..	..	..	..	..	..	..	Manchester steatite (2 slits)	2·30	102	44·4	28·40	510·0	38·50
Water gas	Benzene	90	3,175	301	62·7	289	56	Bengel	1·00	105	105·0	9·45	333·0	31·60

containing 40·4 per cent. of carbon monoxide and 51 per cent. of hydrogen. The apparatus used was the carburettor above described, the temperature of which was kept at 20° C. Each test lasted one hour. The reason for the large quantities evaporated is the fact that the liquid did not nearly approach exhaustion. Tests were made first with the bengel burner, then with an incandescent burner mounted on a Lecomte bunsen, and afterwards with a batswing burner. The carburetted air gas burns well under a mantle, and in the bengel burner; but in the batswing burners, the flame is extinguished on the least draught of air. Hydrogen and carburetted gas, on the other hand, burn very well in these burners. The pressure was 20 to 35 mm.; and the light might have been mistaken for acetylene.

The most notable thing in the table is that the quantities of hydrocarbons removed rise in proportion to the calorific power of the gas. Thus (other things being equal) we get:—

	Light Oil.		Benzene.
Air	665 grammes.	..	465 grammes.
Hydrogen . . .	850 „	..	517 „
Gas	1100 „	..	640 „

The gas plays the minor part of a diluent; but at the same time the choice of this diluent is not immaterial.

It will be seen that 9 grammes of light oil and 101 calories per carcel-hour (or 12·3 grammes of benzene and 117 calories) are required in an incandescent burner. The same burner using hydrogen consumes only 55 to 60 calories. Experiments with a Lecomte burner made in the works of the Paris, Lyons, and Mediterranean Railway Company gave less than 7 grammes per carcel-hour. It is difficult to explain this difference. In the case of air gas carburetted with benzene, the larger quantity of air—say, 26 litres instead of 12 litres per carcel—raises the number of calories from 101 to 117. The same thing is found in testing the flames. Here 41 grammes of benzene replace 39 grammes of light oil, although the benzene is much richer in carbon. I have found a still smaller quantity answer in the case of the "Fontaines à Gaz," due, I believe, however, to the more perfect burner employed. One set of experiments gave me 36 grammes per carcel-hour. This figure fell to 17 grammes when using a "Cromartie" regenerative burner. The light oil burnt alone in a lamp such as is used for petroleum, gave 28 grammes per carcel-hour.

Hydrogen, it is seen from the table, gives a low hydrocarbon figure per carcel-hour, even with a batswing burner. When coal gas is the diluent, the number of calories used is greater than for carburetted air, as is also the weight of the hydrocarbon consumed.

Considering these facts in connection with Professor Lewes's acetylene theory, let it be noted that, if the quantity of benzene used per carcel-hour is only 9·45 grammes, the total quantity of carbon present in the flame is about 31·6 grammes—say, 60 per cent. more than in the flame of carburetted hydrogen. But the heat evolved is almost the same; and it may therefore be admitted that carbon monoxide, which requires comparatively little heat for its decomposition, splits up in the flame into carbon and oxygen—the carbon forming acetylene.

A word may be said on the proper system of carburation, which is not to let the gas take up as much hydrocarbon as it can, but to give it as much as can best yield a mixture of constant composition. The former plan, which is the one followed in all carburettors, can never give anything but a carburetted mixture of variable quality. M. Mallet stated this view very explicitly in 1872.

Passing to another side of the subject, it is well to recall the difference in the efficiencies of ancient and modern illuminants—say, between the old "cock's comb" burner consuming 200 litres of coal gas per carcel-hour, and acetylene burning 6 litres. I consider the future illuminant will be a carburetted gas approaching acetylene in composition. It does not matter to the gas manager whether a 120-litre burner gives 6 carcels with or without a mantle. In point of safety, the latter system is the better.

We can work out the suggestion of M. Bouvier at the Congress of the Société Technique of 1898—viz., the enrichment of poor coal gas by acetylene—and show that the result of using equal weights of acetylene and benzene is nearly the same; but while the cost of a kilo. of acetylene is 1·15 frs. to 1·25 frs., a kilo. of benzene costs 0·3 fr. But this equality of enriching power only holds good when the proportion of either enricher is small. With larger additions, the consumption of benzene for a given increase in lighting power is three times that of acetylene.

But to leave this slight digression, and return to my subject. The use of vaporized liquid hydrocarbons may be as serious a competitor of coal gas as carburetted air gas. Free-flame lamps burning alcohol and benzene (or other hydrocarbons) in admixture, need not engage our time. They are never likely to compete with gas; but carburetted alcohol may find an application as a motive power for automobiles.

In considering incandescent lighting by liquid hydrocarbons, it is interesting to note that the first incandescent lamp—that of Frankenstein, in 1848—consumed alcohol. Petroleum, petroleum spirit, and alcohol are now the three possible fuels—the first for large outdoor lamps, the two latter for indoor use.

The secret of incandescent lighting by alcohol is to mix the air and alcohol vapour before they enter the flame, so as to obtain a very hot flame of minimum size. This can be easily shown by experiment. Alcohol vapour (density, 1·6) gives a gas 1 cubic metre of which weighs 2·070 kilos., develops 12,100 calories, and requires 11·800 litres of air for its combustion. These figures show the necessity of strongly heating alcohol vapour, and supplying it at such pressure from the ejector that the current may draw in eleven times its volume of air, and yet reach the flame in a state of vapour. My experiments show that the temperature of the vapour emitted by the ejector should be at least twice the temperature at which the gaseous mixture is made—say, 160° C. for alcohol, benzene, and petroleum spirit.

Ditmar lamps, and the systems of Washington, Kitson, and others, can only be mentioned here. The former are marvels of simplicity, but it is almost impossible to regulate them; the latter are adapted mainly for very large lamps.

Of the lamp used for this form of incandescent lighting, the Schlesinger type, shown in fig. 1 (p. 958), is the simplest, and the same time the least efficient. A is a small chamber, supplied with oil by the tubes B, which contain cotton wicks, immersed in the oil below. The frame C carries a small heating burner D, to vaporize the oil in A. An incandescent burner (similar to one used for gas) screws on the heating-chamber. Two minutes elapse before the main burner can be lighted. It is put out by extinguishing the small flame under A. It uses 30 grammes of alcohol (or 20 to 22 grammes of petroleum spirit) per carcel-hour. This low efficiency is due to the imperfect heating of the vapour, the amount of alcohol burnt in the small light, and the low pressure.

Fig. 2 shows Meyerberg's wickless model (1894), which has had many imitators. It consists of a Field tube, inverted and placed in the flame. The liquid enters at A (closed at the upper end), into which the smaller tube B is fitted, and closed at the other end by the ejector C. The gallery D, carrying the mantle E and the chimney F, surmounts the whole. A bundle of metallic threads is placed in the tube A, in order to render the vaporization of the oil more regular. The tube itself is screwed to the vessel in the base. The liquid is supplied to the lamp by storage at a higher level, or by air pressure. Only a few seconds are needed to obtain the full light. When properly adjusted, this burner gives very good results. It uses 14 to 22 grammes of alcohol and 10 grammes of petroleum spirit per carcel-hour (Couderchon and Ringelmann). Its principal defect is choking by the products of decomposition of the combustible vapour.

Fig. 3 shows the alcohol lamp of La Société d'Eclairage, de Chauffage, et de Force Motrice, the principle of which—the use of part of the heat of the flame for vaporizing the hydrocarbon—is also that of the Marcus, Doudard de la Grée, Seegrunn, Deselle, and other burners. Though wicks are used, the efficiency is maintained by means of the air pressure; the wicks serve only to aid regular vaporization. A is a hermetically closed receiver with filling-plug B. Above it is a cup C leading to the burner.

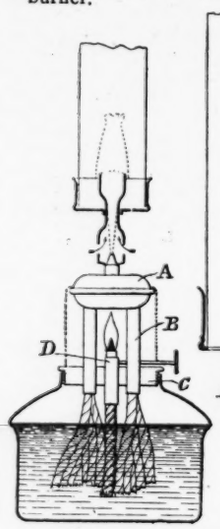


FIG. 1.

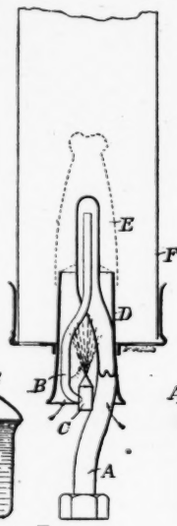


FIG. 2.

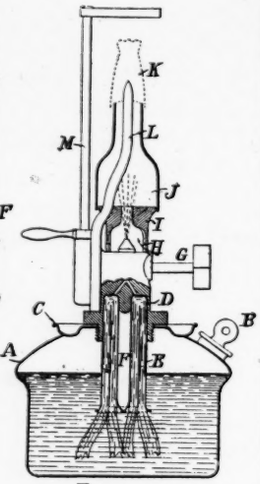


FIG. 3.

The vaporizer is made of a piece of metal D, connected, by means of a tube E, to the centre of a metal cylinder F. The liquid is vaporized in this cavity, the base of which is perforated with holes leading through the cock G to the ejector H, the bunsen burner I, and the mixing-chamber J, on which latter the mantle K is fixed. The arrangement for conducting the heat is double. It consists, first, of a rod L of good conducting metal, placed in the centre of the flame, and conducting the heat to the vaporizer D; and, secondly, of a rod M, surmounted by a disc, by which also much of the waste heat of the flame is led to the vaporizer.

The lamp A being filled with a mixture of benzene (two volumes) and denaturalized spirit (one volume), and the cap D screwed down, pure alcohol is poured into the cup C and lighted. As soon as it has burnt away, the cock G is turned on, and the lamp lighted. The temperature of the oil may rise 30° above that of the outside air, and will thus produce a pressure of about 94 centimetres of water. The heat transmitted can be varied to some extent by the rod M. A small lamp of 2·5 carcel-power requires six minutes for lighting-up, and uses 10 grammes of alcohol and benzene per carcel-hour. With larger (up to 30-carcel) lamps, this latter figure may fall to 7 grammes. The lamps must burn in a fairly constant temperature, for a difference of 1° in the external atmosphere causes an alteration in the pressure of 37 mm. of water.

Passing now to those lamps which have no wick, but vaporize the hydrocarbon by means of the heat of the flame, fig. 4 shows the Lecomte burner, which is notable only for its great simplicity, and for its adaptability to coal gas. In fact, the only modification of fittings required when the lamp is being applied to existing fittings, is a receiver holding liquid to the depth of 20 centimetres. A is a cock fitted to the supply-pipe; B, a screw-nut packed with tow; C, a milled screw working the valve A; E, the alcohol cup fitted to A by the pipe D; F, the base of the burner pierced by the vaporizer; G, the vaporizer, which can be rotated by a metallic joint; H, the ejector; I, the bunsen tube, screwing on to the base of the burner; J, the mantle gallery; K, a regulating-screw to adjust the height of the rod L, holding the mantle M; N, the chimney holder; O, the chimney; P, the wire gauze; Q, a forked support, soldered to F, by which the heat of the flame is conducted to F and G.

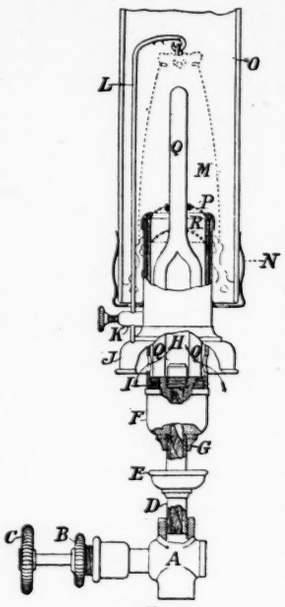


FIG. 4.

The following table gives the results of photometric tests of the gas. The price of coal gas has been placed at 0·3 fr. per cubic metre; denaturalized spirit, at 0·65 fr. per litre, or 0·78 fr. per kilo.; carburetted alcohol, at 0·65 fr. per litre, or 0·76 fr. per kilo.; and light petroleum (·680 sp. gr.), at 0·45 fr. per litre, or 0·66 fr. per kilo., which may be regarded as average prices.

Burner.	Combustible.	Observer.	Intensity in Carcels.	Consumption per Hour.	Cost per Hour.	Consumption per Carcel-Hour.	Cost of a Carcel-Hour.
				Litres.	Centimes.	Litres.	Centimes.
Lecomte Bunsen	Gas	Vautier	8·44	115·0	3·45	12·00	0·36
Welsbach No. 3	"	—	12·27	152·0	4·56	12·40	0·37
Lecomte	Gas at 175 mm. pressure	City of Paris	36·00	315·0	9·45	8·75	0·26
				Grammes.		Grammes.	
Schlesinger	Mineralized alcohol (90°)	Lecomte	2·20	66·0	5·15	30·00	2·34
"	" "	Ringelmann	3·10	121·0	9·45	39·00	3·05
"	Light petroleum	Lecomte	3·20	61·0	4·04	19·00	1·25
Phœbus	Mineralized alcohol (90°)	Sorel	3·61	98·0	7·65	27·10	2·12
Continental	" " "	City of Paris	6·80	95·0	7·41	14·00	1·09
"	" " "	Ringelmann	4·90	108·0	8·42	22·00	1·72
O. Helft	" " "	Hayduck	6·50	115·0	9·00	17·70	1·38
Schwertlampe	" " "	"	6·56	115·0	9·00	17·50	1·37
Denayrouze	" " "	Denayrouze	..	..	..	14·00	1·09
"	Alcohol 1 vol., benzene 2 vols.	Ringelmann	2·50	25·0	1·90	10·00	0·76
Lecomte	Alcohol 66, benzene 20, toluene 14 per cent.	Sorel	5·20	51·0	3·88	9·80	0·75
"	Alcohol 62·5, benzene 37·5 per cent.	"	6·45	65·6	5·00	10·15	0·78
"	Alcohol 95° + 2 per cent. of heavy benzene	"	6·26	75·0	5·86	12·00	0·94
"	Mineralized spirit (90°)	"	5·45	79·0	6·18	14·50	1·13
"	Petroleum spirit	P. L. M. Rly. Co.	4·30	30·0	1·98	6·95	0·46

It will be seen that the same liquid gives one carcel-hour for 1·1 c. or 2·3 c., according to the lamp; that in the best burners alcohol is twice as dear as gas; that petroleum spirit costs only 30 per cent. more than gas (but not in Paris); and that the efficiency of petroleum spirit used direct as a vapour, is greater than when it is diluted with air.

Motor Vehicles in Paris.—We have already had occasion several times to mention in the columns of the "JOURNAL" the revelations of the Paris Exhibition respecting the actual condition of the motor car industry. In a recent report published in the "Engineer," we read that in France, as in England, the most successful motor vans for heavy traffic are coke-fired; and but for the name would not be readily distinguishable from the familiar traction engine. A feature of the French practice in this branch of engineering is the so-called "train scotte," which is, roughly speaking, a goods train of road vehicles drawn by a traction engine capable of steaming at a speed of about 8½ miles an hour. With all three classes of road motors, driven respectively by oil, steam, or electricity, only about one-half of the work indicated by the engine is transmitted to the periphery of the wheels. This means that in these triumphs of modern mechanical skill only about 5 per cent. of the calorific power of the fuel is converted into useful work on the carriage wheels. This is not creditable to mechanical engineering. The horse beats this duty several times over. Electric motors are not yet in the running. A carriage so propelled cannot go more than 60 miles without being recharged—an operation that takes seven hours for five running hours. The usual limit of a run is about 38 miles; so that an electric road car cannot go more than about 20 miles from a charging station. The weight of the accumulators is 30 per cent. of the whole weight on the wheels; and they rapidly deteriorate and wear out. Two acetylene-gas driven cars—a light victoria and a heavy goods van—are being shown in Paris. With all kinds of motor cars, however, the chief source of expense is the tyres. No make of tyre in the composition of which india-rubber enters will long stand the hard usage of motor car wheels on common roads; and, as a matter of fact, the maintenance of either pneumatic or solid rubber tyres costs several times more than the fuel consumed for driving the carriage.

TECHNICAL RECORD.

SELF-LIGHTING GAS-BURNERS.

The very general use of incandescent gas-burners for public and private lighting, which has been the most striking feature in the progress of the gas industry during the past few years, has led to a revival of interest in the question of automatic ignition. The effect of this revival has been seen from time to time in our "Register of Patents," where the various devices for superseding the lamplighter, the match-box, and the flash-light have been duly described. These appliances may be divided into two classes—those in which electricity is employed as the igniting agent; and those in which the action of the gas itself is utilized. The characteristics of some of these lighters have been indicated in three articles in the "Revue de Physique et de Chimie," by M. Pierron, who also dealt with the subject at the International Congress of Applied Chemistry held in Paris last July. In his paper on that occasion, which has been given in "Le Gaz," he to a large extent went over the ground traversed in two of his articles in the "Revue," and therefore his productions may be conveniently noticed together.

M. Pierron first of all deals with the various appliances coming into the group of electric igniters; comprising those requiring manipulation at the burner, and those by which ignition is effected from a distance. The Arnould igniter is a portable apparatus consisting of a hardened india-rubber vessel containing a mixture of bichromate of potash and sulphuric and hydrochloric acid. When in use, pieces of carbon and zinc are acted upon by the mixture, and a current is generated which raises to incandescence a coil of platinum wire. When not in action, the position of the igniter is reversed; and of course there is then no contact with the liquid. In the Lux igniter, the current is obtained from the batteries serving the electric bells; and the appliance is operated by pressing a button. In the Barbier igniter, the platinum wire is placed above the burner. By turning a handle, the tap is opened and electric contact set up which causes the wire to glow and effect ignition. In the Loiseau igniter, the simple turning of the tap is sufficient to cause the wire to glow and light the gas. The igniter which bears the name of M. Née is one of the commonest of the kind, and produces an electric spark by the simple turning of the tap; the current being supplied by four or five Leclanché cells. Among the appliances by which lighting is effected from a distance, M. Pierron describes the Auto-Lux, in which ignition is produced by incandescent platinum wire; and the Pôle, whereby this object is attained by means of a spark. He says, however, in regard to them all, that, notwithstanding their great convenience, they have several inherent defects. In the first place, not only must the batteries or wires be kept in perfect working order, but the appliances are liable to fail in their action owing to imperfect contact. Moreover, their relatively high cost precludes their general adoption.

Having indicated the drawbacks to the use of electric lighters, M. Pierron turns his attention to appliances in which the action of gas is utilized. Before describing them, however, he gives a few historical particulars, showing how investigators have tried to utilize the catalytic properties of certain metals for producing automatic ignition. As long ago as the commencement of the present century, it was known that spongy platinum would become incandescent when in contact with alcohol; would condense a large number of gases, with great liberation of heat; and, even at ordinary temperatures, would cause certain gases to mix with each other or with the oxygen of the air, with a like result. Liebig, Edward and Humphry Davy, Dobereiner, Gay-Lussac, Berzelius, Dulong, Zeise, and others, all in turn studied these various phenomena; and the classic experiment of the hydrogen lamp, in which a jet of hydrogen ignites upon spongy platinum, was well known. However, the black of platinum, as well as that of other metals of this group, presented the defect of sometimes rapidly solidifying; thereby destroying the porosity, and consequently the catalytic properties, of the substance. In order to remedy this, it was necessary to find some means of preventing the solidification while preserving the original porosity; and Liebig, about the year 1829, proposed to distribute the platinum black in various porous bodies. Dobereiner, some ten years later, after having manufactured substances with a clay base, stated that it was preferable to distribute the platinum black in natural or artificial meerschaum. Unfortunately, by working in this way, less solid igniting substances were obtained. They could not stand several hours' exposure in a flame; and the few attempts made to apply them practically were not attended by results having any commercial value. But there appeared subsequently a mechanical device patented by Kent, whose Belgian specification is dated Oct. 17, 1895, and afterwards by MM. Canellopoulos and Kratz-Boussac, whose patent is dated Dec. 19, 1895, which allowed of the utilization of these substances for the ignition of gas.

M. Pierron proceeds to examine the various igniters utilizing the action of gas, from the points of view of their chemical constitution and their employment for ignition. The lighting substance used by MM. Canellopoulos and Kratz-Boussac was that prepared by Duke, in which the platinum black was intermixed with silicate of magnesia. By means of an ingenious mechanical device, the substance remained only a few seconds in the flame on each ignition, and therefore it could be used for a considerable length of time; whereas if it were subjected permanently to the action of heat it would rapidly lose its catalytic properties. The appearance of this appliance led to a revival of the study of igniting substances; and a number of investigations were made with the view of increasing as much as possible their period of usefulness. Starting with the principle that it is the black in the igniting body which, by melting, causes the deterioration of the entire substance, certain inventors sought to obtain a less fusible igniting element with blacks of metals fusible at higher temperatures. Others, ascribing the destruction of the igniting properties of the mixture to the supporting element allied with the platinum, endeavoured to substitute for the usual bodies—clay, meerschaum, asbestos, lava, &c.—those of different chemical composition.

The principle of distribution in a natural porous refractory substance having been indicated by Dobereiner, M. Pierron does not notice any of the patents which, while specifying the use of different mixtures, are simply variants of that principle, but enmerates those only which prescribe substances possessing very distinct chemical functions. First of all, Canellopoulos and Kratz-Boussac, in their French patent dated July 21, 1896, substitute magnesia for meerschaum. Bohm and Sternberg, in their English patent of July 24, mention, in addition to refractory combinations of alkaline, alkalino-terreous, terreous, and heavy oxides, the employment of refractory oxides belonging to this category. MM. Mengers, Franke, and Hurwitz, according to their French patent of March 1, 1897, add the platinic or analogous salts of metallic oxides—for example, oxide of silver or copper. M. Killing, in his Belgian patent of Sept. 27, 1897, calcines cotton thread, saturated with a mixture of platinum chloride and thorium nitrate, and in this way obtains a skeleton or framework of platinum black and thorium oxide. In his Belgian patent of March 9, 1898, M. Pierron employs as the supporting element oxides having acid functions (tungstic, titanic, vanadic, silicic, and niobic acids), either alone or in admixture. Finally, other inventors, ascribing the loss of igniting properties to the presence of water, have endeavoured to remove it. Herr Löwenberg, in a French patent dated April 30, 1896, makes use of natural porous refractory substances (asbestos, clay, lava, &c.), but before doing so subjects them to the dehydrating action of fuming sulphuric acid. MM. Perl et Cie., whose French patent is dated June 30, 1898, ascribe the defects of the igniting substances to the presence of hygrometric chloride of magnesium in the Duke combination; and in order to get rid of it, they treat it with hydrochloric acid.

M. Pierron next takes up the subject of the application of the igniting substances. He remarks that Humphry Davy, in 1821, discovered the property possessed by red-hot platinum wire of remaining incandescent in a mixture of the vapour of alcohol and air. This characteristic of metallic platinum, whether in the melted state or as wire, of being the means, when once heated, of causing the combination of atmospheric oxygen with combustible gases, had also been applied to illuminating gas. M. Ste.-Claire Deville, as well as M. Debray, reproduced Davy's flameless lamp by placing a platinum crucible over a bunsen burner, which was extinguished as soon as the crucible was well heated. If the mixture of air and gas was turned on again when the crucible ceased to be red, it was soon observed to become hot and once more incandescent; and it sometimes happened that the gaseous mixture was again ignited. Since 1894, the principle underlying Davy's experiment has been practically applied. Herr Rosenfeld, in his German patent No. 47,128, described a method of igniting gas, consisting in the employment of a piece of spongy platinum furnished with a wire of the same metal. Under the influence of the gas, the sponge develops heat, and transmits sufficient of it to the wire to cause it in turn to become active, and produce combination of the gas and the atmospheric oxygen, with such liberation of heat as to make it glow and cause ignition of the mixture. One method of carrying out this idea was seen in an appliance formerly sold by the house of Serrin. It was composed of a small support, placed at the side of a batswing burner, and surmounted by an igniting block into which the platinum wire passed. The gas caused the block to become red, heat the wire to a state of incandescence, and produce a light. Another form was that mentioned by Herr Drehschmidt in the "Journal für Gasbeleuchtung" for May 18, 1897. It consisted in suspending from the upper part of the glass chimney surrounding an argand burner, or over a mantle, an igniting substance furnished with a platinum wire. As these bodies could not be used for any great length of time when they had to remain permanently in the flame, endeavours were made to produce mechanical devices to withdraw them from its action as soon as ignition had taken place.

This leads M. Pierron to the consideration of non-durable pastilles as igniters. These appliances are divisible into two classes—igniters in which the flame is displaced, and those in which the pastille itself is displaced. There are in existence a number of appliances by which, on simply turning a tap, the gas is brought into contact with a flash-light, and ignited under the action of a catalytic substance. Subsequently the heat expands a tube filled with air or gas, or a metallic pyrometer, causing valves to work, and the central burner is then lighted, followed by the extinction of the flash-jet. The principle being known, M. Pierron contents himself with describing the best example of

its application—viz., the "Self-Lighter," which is shown in the accompanying illustration (fig. 1). It consists of three parts—the central connection, the igniter, and the pyrometer. The first is the portion of the appliance by which it is attached to the gas-pipe, and contains a distributing-valve. The igniter consists of a flash-light and a small pastille furnished with platinum wire, upon which the jet of gas impinges. The pyrometer is a metal wire, the elongation of which by heat actuates the valve. The working of the distributing-appliance will be understood from the illustration. When at rest, the piping is closed. The pyrometer F (suspended from the arm P) being cold, supports, by means of the rod S and the lever H, the valve V, and keeps it pressed upwards. In this position the flash-jet is in communication with the gas-pipe. When the tap is turned, and the gas enters the pipe, it spreads over the apparatus; but, as it cannot reach the burner proper, owing to the position of the valve, it passes to the igniting substance *Z*, which reddens, and raises to incandescence the little coil of platinum wire, whereby the ignition of the gas at the flash-jet is effected. The flame thus produced slightly heats the pyrometer, which expands, and causes the valve to drop a little, and allow the gas to reach the principal burner, where it is ignited. The flame thus produced imparts additional heat to the pyrometer, the further elongation of which causes the valve to rest upon its seat and cut off the supply of gas to the flash-jet, which is thus extinguished.

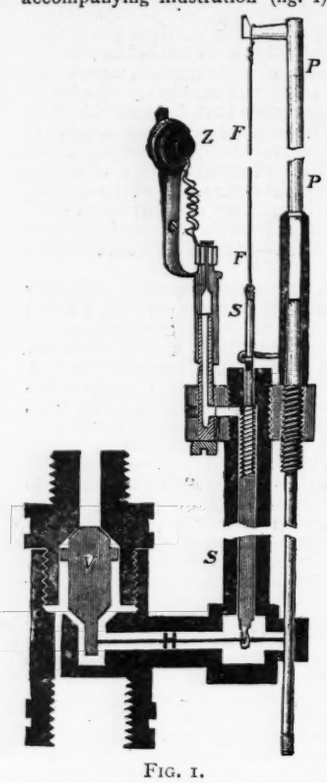


FIG. 1.

Igniting cocks are the next appliances to engage M. Pierron's attention. In these, the pyrometer and valves are dispensed with; and it is the operator himself who, by turning the tap, causes the ignition of the flash-light and the principal burner, and finally the extinction of the former. An example is shown in fig. 2. In ordinary taps, the box has only two holes, and the plug is pierced by a channel. In the self-lighter shown, there is a third hole in the box, by which gas is conducted to the pipe supporting the flash-jet. In addition to the ordinary channel, the plug has two small grooves—one above and the other below it—and going in opposite directions. The object of this arrangement is, when the tap is half open, to send the gas into the groove leading to the pipe supporting the flash-jet. As the tap is opened, the gas is directed only to this jet, at which it is lighted on coming in contact with the igniting substance. On the turning of the tap being continued, the gas passes to the burner, and is lighted by the pilot, which is extinguished when the tap is fully opened. Any kind of burner can be ignited by this appliance; and the principle upon which it is based is one which can be applied in a variety of different ways.

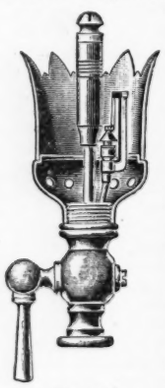


FIG. 2.

In the case of igniters in which the pastille is displaced, the igniting substance is first of all subjected to the action of the mixture of gas and air, and after ignition is withdrawn from prolonged influence of the higher temperature. This can be effected either automatically, by means of a small mechanical contrivance set in motion by the heat, or by a movement performed by the operator himself. M. Pierron gives a few examples selected from a number of arrangements which have been suggested. With regard to the former class, mention is made of the device of MM. Perl et Cie., described in their French patent of July 7, 1897. They place the igniting pastille at the end of a spiral wire, as shown in fig. 3. In the first position, the pastille is in the stream of gas; but as soon as ignition has taken place the wire expands, and draws the pastille down into the cold part of the appliance. Von Vietinghoff Scheel describes in his Belgian patent, dated Sept. 20, 1898, a little apparatus constructed by him for placing on the upper part of the chimneys of ordinary argand or incandescent burners. It is shown in fig. 4. It turns on a knuckle-joint C; and the part above the chimney is a little heavier than the counterbalance P. The chimney is covered by a mica plate pierced with a hole, through which the gas reaches a pastille *p*, furnished with one or more platinum wires *f*, which cause ignition. Under the influence of the gaseous current, the appliance rises again, and withdraws the pastille from the action of the heat.

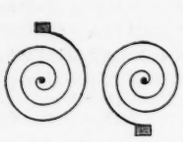


FIG. 3.

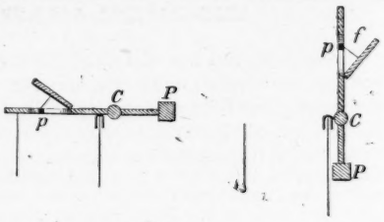


FIG. 4.

An arrangement in which displacement is effected by the operator, is described by De Romocki and Karl Kœnig in their Belgian patent of April 18, 1896. They place the igniter, composed of spongy platinum with wires of the same metal, at the end of a long flexible rod. When the gas-tap is closed or only partially open, the igniter is above the chimney. The gas flows when the tap is turned, and ignition takes place. When the tap is fully open, a catch upon it strikes against the support, and, moving it aside, withdraws the igniter from the action of the hot gases. The latest and simplest device consists in suspending the igniter at the end of a long support held in the hand. When the tap is turned on, it can be placed over the chimney and removed when the gas is lit. To prevent waste of gas, the igniter may be put under a little mica cover, shutting the chimney more or less completely.

When durable pastilles are employed, all mechanism becomes unnecessary. It is sufficient to place them, with their platinum or other wires, in a position where they are permanently subjected to the action of the mixture of gas and air. For example, M. Pierron, in his Belgian patent of March 11, 1898, shows that two igniting substances, connected by platinum or iridium wires, allowing of easy suspension upon a mantle, can be employed. The glass chimney can also be utilized as the support, &c. Finally, platinum foil can be used (as shown by Herr Breslauer in his German patent of April 10, 1898), or wire gauze. With batswing burners, a special igniter can be made with a pastille fixed in a smoke-plate suspended over the burner. Examples of the two types of igniters here referred to are shown in figs. 5 and 6.

FIG. 5.

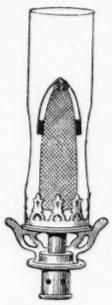


FIG. 6.

M. Pierron next deals with the subject of self-lighting mantles; but his observations on this part of the subject must be left for another article.

THE ESTIMATION OF PRUSSIAN BLUE IN SPENT OXIDE, AND OF CYANOGEN IN GAS.

Dr. A. O. Nauss, of the Carlsruhe Gas-Works, has recently described, in the "Journal für Gasbeleuchtung," a new means for the estimation of prussian blue in spent oxide, which forms also the basis of a method of estimating cyanogen in coal gas.

He refers to the commercial importance which cyanogen preparations have acquired of late years, and to the necessity for a rapid and reliable method of estimating the cyanogen in gas-works products, from which the bulk of the commercial preparations are now derived. He refers to the three recognized methods for the estimation of prussian blue in spent oxide—viz., (1) Knublauch's; (2) the modified Zulkowsky's method; and (3) Drehschmidt's. The first two, though widely used, have the defects and errors inherent to tests made by the help of spots of an external indicator, by which the final point of the reaction is detected with difficulty, or only after protracted experience of the method. Drehschmidt's plan, especially as modified by Burschell, is a very accurate one, as Lubberger's investigations have clearly proved.* But it is slow and tedious; and an unusual degree of purity of the reagents is necessary, for they must be quite free from chlorine. Bearing in mind the fact that, for use in a technical laboratory, a system of analysis must be as simple as possible without lack of accuracy, Dr. Nauss succeeded in devising the new method, which we will now describe.

It is founded on the decomposition of prussian blue by alkalies, which takes place according to the equation—

$$Fe_7(CN)_{18} + 12NaOH = 4Fe(OH)_3 + 3Na_4Fe(CN)_6$$

The blue is accordingly treated with hot solution of caustic soda of known strength, until the feeble green colour of the liquid

* See "JOURNAL," Vol. LXXI., p. 586.

finally disappears. An excess of caustic soda actually is employed, and is neutralized with acid of equivalent strength. Further addition of acid changes the golden yellow colour of the liquid to greenish yellow, owing to the reformation of prussian blue. No special indicator is required, as the blue answers the purpose. Care must, however, be taken to work with a thoroughly hot liquid, as the final reaction only then occurs sharply and clearly. If soda solution of $\frac{1}{10}$ normal strength is used, 1 c.c. is equivalent to 0·001431 gramme of prussian blue. The analysis of a sample of spent oxide should be conducted as follows.

Ten grammes of the oxide are repeatedly agitated in a 500 c.c. flask with 50 c.c. of 10 per cent. solution of caustic soda; and the whole is left at the ordinary temperature until the blue in the oxide has been completely decomposed by the solution of soda. According to Knublauch, 15 hours are needed for this decomposition. The use of the dilute solution of soda avoids the formation of sodium sulphide. The flask is then filled up to the 500 c.c. mark with water, and an additional 5 c.c. of water added to compensate for the space occupied by the oxide. After several vigorous shakings, an aliquot portion of the liquid is filtered off —say, 50 c.c.—which would be equivalent to 1 gramme of oxide. To this is run in from 10 to 15 c.c. of a hot acid solution of iron alum (200 grammes of iron alum to a litre of water and 100 grammes of sulphuric acid), in order to convert the sodium ferrocyanide present into prussian blue. It is heated on the water-bath until the peculiar sweet smell, which probably proceeds from the decomposition of cyanogen compounds which do not form blue, has disappeared. It is then passed through a filter in a hot-water funnel; and the residue is washed with hot water until the sulphuric acid is completely washed out. The filter containing the blue is next put in a flask, to which water is added and brought to boiling with frequent agitation, in order to remove the blue as much as possible from the filter. The blue is then directly determined by means of solution of caustic soda. Sufficient of this solution of $\frac{1}{10}$ normal strength is added, by degrees, to decompose all the blue. The decomposition takes place rapidly on heating for a short time; and the excess of solution of soda is then titrated back by the gradual addition of acid of $\frac{1}{10}$ normal strength—the liquid being continually heated and agitated meantime. The heating is essential, as otherwise, even in the presence of alkali, the green colour due to the reformation of prussian blue persists for a short time. When the feeble greenish yellow colour first becomes permanent in the solution, the final point of the reaction is reached.

Comparative analyses carried out by this system and the Drehschmidt-Burschell method gave the following concordant results:—

Sample No.		1.	2.	3.	4.	5.	6.	7.
Percentage of prussian blue	By the new system	8·08 and 8·15	7·02	8·65	8·29	7·63	7·34	7·72 and 7·65
	By the Dreschmidt-Burschell method	8·11	7·30	8·86	8·11	7·65	7 51	7·63

Parallel tests were likewise made on spent oxides with and without the addition of a known amount of potassium ferrocyanide in solution; and the results were similarly concordant.

Dr. Nauss further describes how the process may be extended to serve for the estimation of cyanogen in gas. One hundred litres of the gas are passed through two absorption vessels in from one to two hours. The vessels are charged with 20 c.c. of solution of ferrous sulphate (1 part of the salt in 10 parts of water), and 20 c.c. of solution of caustic potash (1 part of potash in 3 parts of water); 10 c.c. of each solution in each vessel. The contents of the vessels are washed, after the passage of the gas is ended, into a 500 c.c. flask; and more of these two solutions is added until black sulphide of iron is no longer precipitated. An addition of about 1 gramme of lead carbonate completes the removal of sulphuretted hydrogen. The solution is heated for some minutes, then cooled, and the flask filled to the mark by the addition of water, of which a further 5 c.c. is added to compensate for the space occupied by the precipitate. After vigorous agitation, the contents of the flask are filtered through a dry filter, and 50 c.c. of the filtrate is poured into excess (20 to 30 c.c.) of hot solution of iron alum in order to precipitate the prussian blue, after a little warming on the water-bath with dilute sulphuric acid. The analysis then proceeds as in the case of the estimation of prussian blue in spent oxide, described above. A cubic centimetre of the solution of caustic soda of $\frac{1}{10}$ normal strength is equal to 0·0007794 gramme of cyanogen.

Mr. Tesla's Latest "Discovery."—If a statement contained in the "Globe" last Friday may be taken as correct, the idea of insulating electrical conductors by laying them in troughs and freezing them, to which reference was made in the "JOURNAL" for the 4th ult. (p. 575), did not originate with Mr. Tesla, but with Dr. R. A. Fessenden. It appears that the latter suggested, in a paper presented to the American Institute of Electrical Engineers in 1898, that the conductors could be made hollow, and laid in a trench containing water. Cold brine flowing through the conductors would freeze the water and insulate the conductors, and would serve to cool houses or make ice, &c. Mr. Tesla's American patents were only applied for on the 15th of June last; and, according to Dr. Fessenden, they are invalid.

THE KITSON HIGH-POWER INCANDESCENT OIL-LAMP.

It is very nearly a year since we first described the Kitson high-power incandescent oil-lamp; and occasional references in the meantime have recorded the successes of the system at exhibitions and elsewhere. The latest was the gold medal awarded at the Paris Exhibition; and in Paris the Kitson Syndicate are now setting up an installation of their street-lamps on a scale which will not be found outside the American towns in which they have been extensively adopted. But starting off on this side in good style under the patronage of the Municipality of Paris, who have a *penchant* for brilliant street lighting, the system is bound to make headway.

At present, the Quai des Tuileries from the Pont de Royale to the Place de la Concorde is lighted by the new lamps; and their location will therefore be well known to those delegates to the recent International Gas Congress who visited the Clichy works of the Paris Gas Company. For a description of the system we must refer readers to the "JOURNAL" for Nov. 28 last; but an idea of the form of lantern and column adopted for this particular installation is conveyed by the accompanying

illustration. Ordinary petroleum oil is used; and the lamps are each fitted with a mantle 2 inches in diameter, giving an actual illuminating power of 995 candles. This type of lamp was recently tested by the Paris Municipality at their laboratory, when it was found that, with a consumption of 400 grammes of oil per hour, each burner gave 10·36 carcels. Those who are acquainted with this portion of the Tuileries will remember how dismal it has been at night, and so poorly lighted that it has been difficult to see one's way on a dark night. But since the new system has been introduced, one can quite easily read a newspaper on any portion of the Quai. The light is seen to advantage on the opposite side of the Seine, in front of the Gare d'Orleans. Undoubtedly the Quai now ranks among the most brilliantly illuminated streets in Paris. There are eleven posts, each carrying three lamps. A less number of lamps, however, would light the Quai quite as well if they were distributed on both sides of the street. The present posts are in one line; and half of the light is thrown over the walls of the gardens. Consequently, as these are closed at night, one-half of the light is wasted. In all probability, the position of the lamps will be changed after the present demonstration has been completed. Early next month, the Kitson Company will commence the erection of a hundred lamps in the Bois de Boulogne.

Incidentally it may be remarked that for some months the same system of lighting has been in operation in the grounds of the Czar's palace at St. Petersburg.

In regard to the cost of operating the Kitson system, the following interesting record has been furnished by Mr. F. H. Richardson, of the North-Eastern Marine Engineering Company, Limited, Sunderland. The figures refer to nine 1000-candle power lamps which the Company have in use, and cover the four complete weeks ending on Friday, the 28th ult.

	Oil Used. Gallons.	Hours Run.
First week ending Friday, Sept. 7 . . .	41 ..	78½
Second ,, ,, ,, Sept. 14 . . .	39 ..	68
Third ,, ,, ,, Sept. 21 . . .	40 ..	72½
Fourth ,, ,, ,, Sept. 28 . . .	41 ..	71
	161	290

Total gallons of oil at 9½d. per gallon for 290 hours .	£6 7 5½	
Mantles	£0 18 9	
Glass	0 10 0	
Gauzes	0 2 0	
Man's time	1 0 0	2 10 9
Total	£8 18 2½	

£8 18s. 2½d. is thus the total cost for 9000-candle power for 290 hours, or $\frac{1}{10}$d. per lamp per hour. The average number of hours the lamps are operated per day is 14⅛. Mr. Richardson concludes his report with the remark: "The above shows a saving of ⅛d. per lamp per hour, or 20 per cent. over what the Kitson Syndicate stated."

The Gas Interest in the New Parliament.—Two of the London Gas Companies will be represented in the new Parliament. Mr. John Aird, whose return for North Paddington was noticed last week, is a Director of the Gaslight and Coke Company, and Sir J. C. R. Colomb, K.C.M.G., who retains his seat for Great Yarmouth, is upon the Board of the Commercial Gas Company. Sir F. T. Mappin, Bart., the Chairman of the Sheffield United Gaslight Company, was returned last Tuesday for Hallamshire. Sir Frederick, who has been both Mayor and Master Cutler of Sheffield, is a Liberal; and his majority over the Conservative candidate was 1750, as compared with 895 at the previous election. Mr. Norval W. Helme, who has defeated Colonel Foster, the Conservative member for Lancaster in the old Parliament, has for some years been Chairman of the Gas Committee of the Corporation. Last Saturday, Sir William Arrol was again returned for South Ayrshire with an increased majority.

Acetylene Lighting in Bavaria.—According to a recent report by Mr. F. D. Harford, the Second Secretary to Her Majesty's Legation in Munich, acetylene lighting is making good progress in Bavaria. A very large firm, who erect extensive acetylene installations, principally for factories, has been commissioned by the Bavarian State Railways to light several railway stations with pure acetylene, and to erect the necessary plant for lighting railway carriages with acetylene oil gas. The railway station at Oberhausen is now attached to the acetylene gas-works of the firm alluded to; and further orders for lighting with acetylene oil gas have been placed with others. The first acetylene gas-works for lighting small towns was erected at Hassfurt—a place of 2500 inhabitants; the price being rather less than ½d. per hour, and the illuminating power 20 candles. There are 26 other small towns lighted in this way in Germany; and Mr. Harford says it would appear that the Empire is likely to make herself as pre-eminent in the acetylene industry as she has done in that of electricity. He cites Mr. F. Rose, the British Consul at Stuttgart, as his authority for the statement that at the close of the past year there were 120 firms engaged therein in Germany.

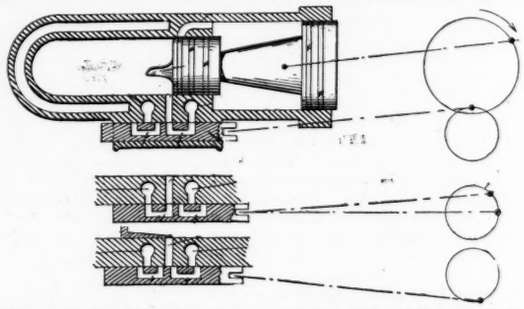
Acidity of Moorland Waters.—In a paper read before the British Association, Mr. W. Ackroyd, F.I.C., Public Analyst for Halifax, dealt with the above subject. He remarked that in 1881, when the action brought by Mr. Milnes against the Huddersfield Corporation was much under consideration, no satisfactory explanation could be afforded of the circumstance that moorland waters may give rise to plumbism; and it is only during the present decade that it has been clearly understood that the plumbo-solvent action of these waters is to be associated with acidity, due to carbonic anhydride and peaty acids. It may be very high, as from peaty gathering-grounds of small incline (say 1 in 44), or comparatively low, as in those of steep inclines (say 1 in 12). In the former case, violent action on lead precludes the use of the water for domestic consumption; and in the latter even a limit must be placed on the degree of acidity allowable. Mr. Ackroyd has never learnt of the occurrence of plumbism where the acidity of the water has been under the equivalent of 0·5 part of sulphuric acid per 100,000 parts of water; and this he tentatively proposes as a limiting standard of acidity for potable waters of moorland origin when the acidity is determined with phenolphthalein as the indicator. The average acidity of nine samples of water not above suspicion in this respect was 0·63—ranging from 0·53 to 0·91; while, on the other hand, 61 samples above reproach, from neighbourhoods where plumbism has not been known, had an average acidity of 0·27, the extremes being 0·20 and 0·41 part.

REGISTER OF PATENTS.

Gas-Engines.—Melhuish, A. G., of Peckham, S.E. No. 20,602; Oct. 14, 1899.

This invention relates to a method of distributing or regulating the inflow of the combustible mixture to the cylinder of a gas-engine, and also the outflow of the exhaust gases; the object being to so construct and arrange the operating parts, that ordinary mushroom, butterfly, or other valves, that fall or are pushed upon their seating (and their consequent rattle and noise, and their liability, by the adhesion of foreign matter upon their faces, to get out of order), are dispensed with. Moreover, the operative parts before mentioned are so placed that no orifice (inlet or outlet) occurs in the combustion chamber or working part of the cylinder, except at the part near the end of the piston stroke, where there is less liability of leakage during the expansion of the exploded charge.

The invention is particularly applicable to the class of engine described in patent No. 9038 of 1895. The working cylinder is arranged without a valve, and the port that communicates with the atmosphere and is uncovered by the working piston, at or near its extreme out-stroke, is covered by a slide or D-valve, operated preferably by an eccentric from the crank-shaft. This D-valve slides upon a face in which there are three ports—one (say) above and the other below the port communicating with the cylinder—one of the ports communicating with an air supply, and the other with an exhaust-pipe. The slide or D-valve, when in action, alternately puts the air-supply port and the exhaust-port in communication with the middle port leading into the cylinder; the position of the eccentric on the crank-shaft being so arranged that the following operations take place in the sequence required (it should be said here that the top of the working piston is fitted or formed with a deflector, for directing the incoming gases to the combustion end of the cylinder). At the point nearly coinciding with the extreme outstroke of the working piston, the



middle port is passed by the piston, and the slide or D-valve puts the middle port in communication with the exhaust-port for the relief of pressure in the working cylinder; the relation of the eccentric with the cranks being such that the D-valve is moved to cut off the exhaust, and open communication with the air-inlet at the same time that the working piston opens communication with the larger cylinder for suction to take place. This causes an inrush of air and gas to enter the working cylinder, and be deflected towards the combustion chamber, for compression by the return stroke, when communication is again opened to the exhaust-port by the slide or D-valve for the discharge of the contents from the larger diameter cylinder. The slide has a hole or small port, which, coinciding with the gas-inlet at the same time as the air-admission port, allows the gas and air to enter together.

In the accompanying diagram there is shown a sectional plan of the cylinder as constructed in the 1895 patent, but without valves; also views showing the different positions of the slide-valve.

Discharging the Products of Combustion from Gas-Fires, &c.—Beutier, L., and Vernier, C., of Paris. No. 21,417; Oct. 26, 1899.

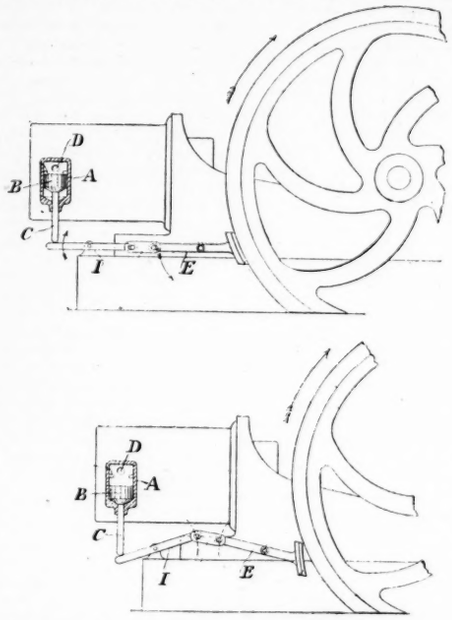
The patentees claim as their invention the construction of an apparatus for the discharge of the products of combustion arising from gas-fires (and more especially from bath-heating appliances), consisting of a pipe with a shoulder, provided at its inlet end with a kind of suction lantern, and at its outlet with a valve-box furnished with an inclined plate, in which are formed apertures adapted to be closed by valves maintained open owing to their own weight. The admission lantern is provided with a collar, into which the discharge-pipe fits; this latter being mounted upon the apparatus "in such a manner that there exists in the piping a continuity of passage, through which the air of the room may be drawn, so as to pass out through the valve-box." The suction-lantern forms, in reality, a preliminary orifice for the evacuation of the foul air during the continuance of each air current.

Starting Gas-Engines.—Bellamy, A. R., of Stockport. No. 21,050; Oct. 21, 1899.

The patentee remarks that, in starting gas-engines, it is a common practice to turn the fly-wheel by hand until the crank is in the best position to receive the starting impulse. Gas or explosive mixture is thus admitted, or forced into, the cylinder and combustion-chamber behind the piston, and, when a certain compression is reached, fired. It is found, however—and particularly with large engines—that the compressed charge behind the piston has a tendency to start the engine before the explosion takes place, thus moving the crank from its position, and neutralizing the efficiency of the initial explosion. To prevent this, brakes have been used which have been taken off by hand just prior to the explosion; but the object of the present invention is to provide means whereby such braking surface shall be automatically removed upon the initial or starting explosion taking place.

To effect this, there is provided a cylinder A, having a piston valve B sliding therein, and carrying a piston or stem C, the end of which protrudes out of the cylindrical casing. The cylinder A is in communication with the combustion-chamber of the engine by means of a port D. A suitable brake-lever E is mounted in juxtaposition with the flywheel (or it might be a brake-pulley, or other revolving part of the engine); and

this brake-lever is connected to a pivoted lever I. The tendency of the flywheel being to turn in the direction of the arrow, the brake-lever E and lever I are affected as shown by the arrows; but motion in this direction is resisted by the stem C of the piston-valve, which is arranged to be in contact with the lever. The brake-block is thus maintained in frictional



contact with the flywheel. On the initial or starting explosion taking place, the pressure of the gases is conducted to the cylinder A, through the port D, forcing the piston-valve B down upon its seat, as shown. The stem of the piston thus turns the pivoted lever I upon its fulcrum, raising the attached link, and thus removing the brake-block from contact with the flywheel.

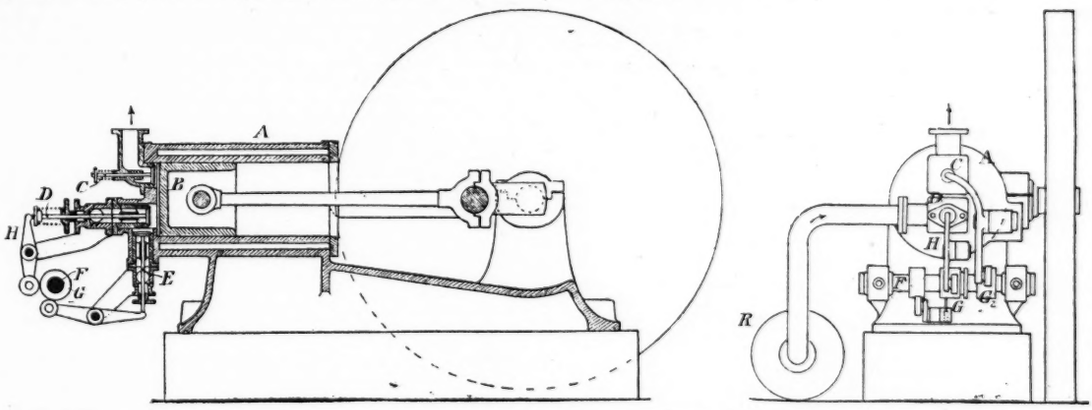
Working Two-Stroke Cycle Gas-Motor Engines.—Abel, C D.; a communication from the Gasmotoren Fabrik Deutz, of Koeln-Deutz, Germany. No. 23,236; Nov. 21, 1899.

This invention relates to means for working two-stroke cycle gas-motor engines, whereby homogeneous compressed charges of gas and air mixture are introduced and ignited within the working cylinder, after this has been cleared of combustion residues and still burning gas particles, whereby "an absolut ly reliable ignition is ensured, while the heat generated by the combustion is utilized to the greatest possible extent." According to this improved method of operating, there is forced through the engine cylinder (which has no compression space), shortly before the piston reaches the inner dead-centre, a scavenger charge of air, which carries with it the remaining combustion gases and any particles of still burning gas mixture, and discharges the same through the discharge-valve. On the piston arriving at the dead-centre, the discharge-valve and scavenger air-valve are closed, and a previously formed homogeneous mixture of gas and air is introduced into the cylinder through a charging-valve, while the piston is performing a certain portion of its out-stroke. After this, the charging-valve being closed, the charge is ignited, and the expansive action due to the heat generated causes the piston to complete its out-stroke in doing work.

This method (say the patentees) differs from the known methods of working two-stroke gas-engines heretofore employed, in that the premature ignition of the charges which frequently occurs with the known arrangements is avoided, owing to the entering combustible charge becoming fired by residual burning gas particles, or by the highly heated combustion residues of the previous charge. On account of this premature ignition, it was, generally speaking, not practically possible to work two-stroke motors by means of previously formed homogeneous explosive mixtures, as the store thereof contained in the reservoir would be liable to be exploded by such premature ignitions. The two parts of the mixture—namely, the air and gas—had, therefore, to be stored separately in different reservoirs, or in the same reservoir, without being mixed before entering the cylinder; and owing to the shortness of the charging period, they had not time to mix thoroughly so as to ensure a reliable ignition and rapid combustion.

The suggested new method of working, however, "effectually avoids the liability to premature ignition by causing the combustion residues and particles of burning gas to be swept out of the cylinder by a scavenger charge of air, enabling explosive charges to be used of a perfectly homogeneous nature previously formed outside the cylinder." On the other hand, two-stroke gas-motors in which a scavenger charge of air has already been used for clearing out a compression space existing in the cylinder behind the piston when at the end of the in-stroke, differ essentially from the present improved method, both as to the manner of forming the charges and as to the volume of the scavenger charge of air required.

With such motor-engines, the ignition of the charges is effected when the piston arrives at the inner dead-centre; so that the introduction of the charges must necessarily be effected already during the compression period. Consequently, not only the compression space, but also a considerable portion of the space passed through by the piston, requires to be filled with clearing air or air for combustion, into which the gas then enters; and therefore the mixing of the gas and air constituting the combustible charge can only take place in the cylinder itself. Furthermore, with existing methods, a considerable quantity of air is necessary for the scavenger charge, as this has to force out a large volume of combustion gases contained in the compression space, and a large portion of the cylinder. The scavenger charge remaining in the cylinder no doubt (the patentees remark) serves as the air supply for the next explosive charge; but, owing to the unavoidable mixture of the scavenger charge with the combustion gases, a very large volume of air must be employed in excess of that required for the explosive charge, if all the combustion gases are to be expelled.



According to their present invention, on the other hand, only a comparatively small quantity of air is required for the scavenger charge—namely, only slightly more than the volume represented by the small dead-space or clearance between the piston and cylinder end, so that a saving is effected both as to work done and weight of engine. Lastly, a very energetic cooling and clearing of the piston's surface is effected, as the scavenger charge has to force its way at high speed through the very narrow clearance or dead-space between the piston and cylinder end, whereas with the existing methods the scavenger charge has to pass through the large capacity of the compression space and part of the cylinder, in which it consequently only travels at slow speed, and with imperfect contact for cooling purposes.

The illustration shows a longitudinal section and end view of a gas-motor engine working according to the present invention. A is the engine cylinder; B, the piston; C, the discharge-valve; D, the admission or charging valve for the explosive charge; E, the valve for the scavenger air-charge; and R, the reservoir for the compressed explosive mixture. Towards the end of the discharging period, the air-valve is opened, and the entering air (supplied in any suitable manner) drives the remaining combustion products out through the open discharge-valve. At the dead-centre, both valves are closed. On the other hand, the charging-valve is opened, and admits compressed explosive mixture into the cylinder during the first part of the piston's out-stroke, which charge is ignited directly after closing the charging-valve. The pressure in the cylinder then suddenly rises, and then gradually decreases, during the remainder of the piston's out-stroke, after which the discharge-valve is opened. The valves are actuated by means of a way-shaft F, driven from the engine-shaft, and having cam-discs G, which effect the opening of the valves through rollers and levers H. The regulation of the engine is obtained by varying the duration of the admission of explosive mixture, and consequently the volume of each explosive charge.

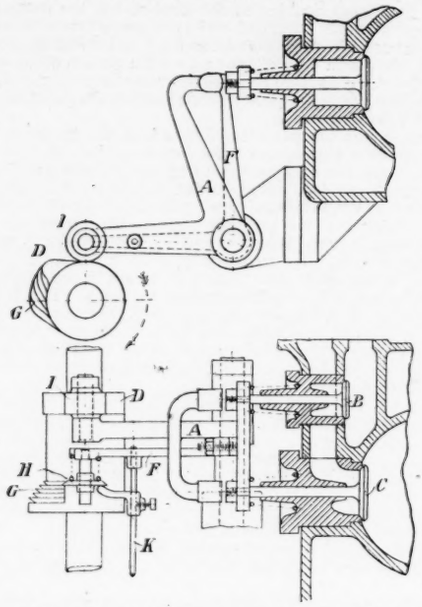
Internal Combustion Motors.—Crossley, W. J., of Manchester, and Atkinson, J., of Marple. No. 21,734; Oct. 31, 1899.

This invention relates to internal combustion motors operating on the four-stroke or "Otto" cycle. It has for its object the regulation of the power developed at each ignited charge by varying the volume of gas and air drawn in to make such charge—these volumes being altered automatically by the governor, within certain limits, so as to be suitable for the load the motor has to drive without cutting out charges. This maintains a more equable rate of speed. The means employed for carrying out this object are mainly in connection with the gas-valve and the charge-admission valve, with the gear employed to operate them.

The illustration (p. 964) shows an elevation (partly in section) through the admission-valve, and a plan of same (also partly in section) through the admission-valve and the gas-valve.

One lever A is arranged to open the gas-valve B and the charge-admission valve C, by means of a cam D and a substantial roller I; while a second lever F, cam G, and roller H (or its equivalent) control the valves

when once opened, and decide the variable timing of their closing by means of the various steps in the cam. The heavy work of opening the valves B and C is done by gear suitable for the purpose; while much lighter gear is employed for the purpose of keeping them open and allowing them to close. The timing of the closing is decided by the governor

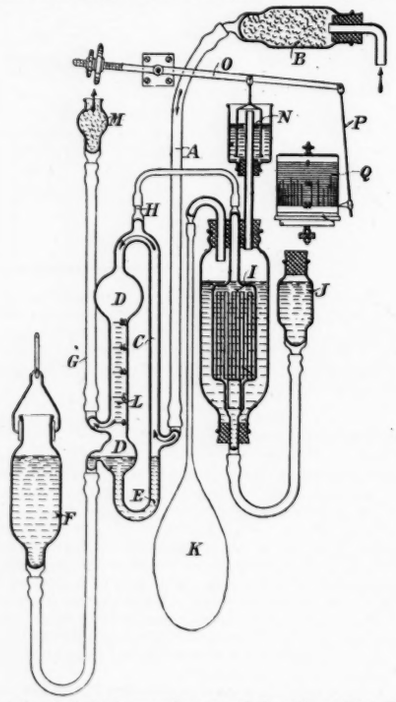


moving the light roller H, so as to engage with any desired step in the cam G, which thus requires to control light parts that are easily moved, instead of the heavy parts necessary if the same gear was used for both opening and closing the valves. At the time of closing, the heavy opening gear has been disengaged by the roller I passing the short lifting portion of the cam D. The variable closings may be obtained by using dies with different depths of notches, into which knife-edges engage at each reciprocation of the levers, or by means of the use of variable steps in the cam G, as shown; the dies, or the roller H, being moved into any desired positions to suit any of the notches or steps by means of the governor through the track-rod K. As these notches can, say the patentees, be made very narrow, the working range of the governor may thus be kept small.

Apparatus for Analyzing Gases, and Indicating and Recording the Results of the Analyses.—Arndt, M., of Aachen, Germany. No. 12,278; July 7, 1900.

This apparatus is designed with a view to making estimations of the constituents of gaseous mixtures by absorption, in a simple and rapid manner. It is without cocks, or valves, or tubes, adapted to be squeezed and released.

The engraving is a part sectional elevation of one of the two slightly modified forms of the apparatus. The gas to be analyzed is passed in



through the tube A (which may be provided with a filter B), and the tube C to the vessel D, which is designated the gasholder. E is a bend connecting the bottom of the tube C with the lower part of the gasholder, with which also the vessel F, containing water or other sealing liquid, is in communication through a flexible tube. A gas-discharge tube G, connected with the bottom part of the gasholder, has its lower mouth above the level of the mouth of the bend below the tube A, which again must be at such a height that it is above the junction of the tube E with the space at the bottom of the gasholder. The tubulure H is connected by flexible tubing with the chamber I, to which absorbing liquid can gain access from the surrounding vessel through the apertures at the bottom. The bottom of the vessel is connected by flexible tubing with the charging-vessel J. A flexible tube connects the upper part of the vessel through a bend with a thin india-rubber bag K, which prevents access of air to the absorbing liquid, and, when the apparatus is at rest, maintains equilibrium between the pressure in the air-space of the absorbing vessel and the atmospheric pressure. The absorbing surface in the chamber I is augmented by the insertion of tubes, spheres, or other bodies.

To conduct an analysis, the vessel F is lowered to its bottom position (as shown); and the gas to be analyzed is passed through the apparatus in the direction indicated by the arrows I. and II. The vessel F is then raised until the sealing liquid closes the passage at the foot of the tube A, thereby cutting off the gasholder from the gas supply. The vessel F is further raised until the discharge-tube G is similarly cut off by the sealing liquid, and a sample of the gas remains enclosed in the gasholder D and tube C under atmospheric pressure. A scale L (having its zero at the level of the top of the mouth of the gas-discharge tube) is graduated into percentage divisions of the volume of gas thus enclosed. On raising the vessel F still further, the sealing liquid will rise into the narrow tube H, and the sample of gas will be driven into the chamber I, displacing a portion of the absorbing liquid, which will pass into the vessel, and drive air thence into the bag K. The sample is thus placed in contact with the absorbing liquid, with which the surfaces of the tubes are wetted. The constituent of the sample of gas on which the absorbing liquid acts is thus removed by it from the gas. On lowering the vessel F, the residue of the gas is drawn back from the absorbing chamber into the gasholder D. The vessel F is held at such a height that the surface of the liquid therein is at the same level as the surface of the liquid in the gasholder; and the percentage volume of the constituent of the gas which has been absorbed may then be read off directly on the scale L. To prepare the apparatus for a fresh analysis, it is only necessary to lower the vessel F to its original bottom position. If desirable, the gas may be admitted to the apparatus through the discharge-tube G, which, for this purpose, may be provided with a filter M. Tube A then acts as the discharge-tube.

An automatic recording device may be used in conjunction with the apparatus, consisting of a tube which connects the air-space above the absorbing vessel with a receiver N, which dips in sealing liquid in the vessel shown. The top of the receiver is connected by the rod with a lever O, pivoted on a fixed pin. One end of a rod P is attached to the lever; and the other end carries a marking stud, which leaves a record of the movements of the receiver N, under the influence of the air pressure in the absorbing vessel, on a paper strip Q placed on a revolving drum. An adjustable balance-weight is attached to the opposite end of the lever. To bring the recording device into operation, the tube between the bladder K and the absorbing vessel is plunged in it to such a depth that its end is sealed by the liquid before all the air displaced has passed into the india-rubber bag. The remainder of the air displaced then passes into the receiver N, and actuates the marking-stud. For instance, if the gas under examination will never contain more than 20 per cent. of the constituent which is to be determined, the tube is adjusted so that its end becomes sealed when 80 per cent. of the volume of the sample under analysis has passed into the india-rubber bag. The air which afterwards passes into the receiver actuates the marking-stud; and if the strip of paper be marked in 20 divisions, of which the zero point is the highest, the number of divisions, read downwards, to which the marking-stud rises, will indicate the percentage of the constituent absorbed in the sample of gas.

The absorbing liquid may be varied according to the gas to be determined—*e.g.*, potash lye for carbonic acid, pyrogallate for oxygen, and cupric (? cuprous) chloride for carbonic oxide.

APPLICATIONS FOR LETTERS PATENT.

17,383.—Mette, L., "Automatic gas-igniters." Oct. 1.

17,387.—Smith, J. W., and Glover, R. T., "Fuel for gas-fires." Oct. 1.

17,425.—Crossley, W. J., and Coster, A. V., "Internal combustion motors." Oct. 2.

17,466.—Adolfsson, A. E., "Acetylene gas generators." Oct. 2.

17,502.—Altmann, F., "Replacing incandescent lamp chimneys." Oct. 2.

17,503.—Lanchester, F. W., "Gas and oil motor engines." Oct. 2.

17,542.—Potter, W. G., "Acetylene generators." Oct. 3.

17 561-2.—Forini, G., and Heller, G., "Acetylene generators." Oct. 3.

17,586.—Herring, W. R., "Coal-measuring chambers in connection with inclined gas-retorts." Oct. 4.

17,597.—Hilton, F., and M'Laine, J. R., "Gas and oil cooking stoves." Oct. 4.

17,598.—Proctor, H. F., "Lanterns for street lighting." Oct. 4.

17,628.—Knaak, F. C. F., "Production of illuminating gas." Oct. 4.

17,635.—Calvert, G., and Morrell, R., "Automatically turning on gas, should the current fail in a place electrically illuminated." Oct. 4.

17,709.—Heidemann, H., and Axdorfer, G., "Burners for gaseous mixtures." Oct. 5.

17,731.—Atkins, G. J., "Generation of acetylene gas." Oct. 6.

17,734.—Crossley, W. J., and Atkinson, J., "Purifying the gas from gas-producers, and heating and moistening the air supplied to the producer." Oct. 6.

17,739.—Ohlsen, W. H. F., "Gas-compressing apparatus." Oct. 6.

17,762.—Lane, H., "An improved gas for lighting, heating, and other purposes, and apparatus for use in connection therewith." Oct. 6.

17,770.—Forti, V., "Lighting and extinguishing distant gas-burners." Oct. 6.

The Local Government Board have granted sanction to the Harrogate Corporation borrowing £40,000 for water-works and main extensions.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Results of the American Coal Tests of the South Metropolitan Gas Company.

SIR,—We have had many inquiries as to the working results from the American coal recently tried at several of our works. I shall be glad if you will permit me to make use of your columns for my reply, as the information will probably be of interest to many of your readers.

Gas made per ton (corrected to 30 in. and 60°), 10,550 cubic feet.

Illuminating power, 16½ candles.

Coke, very good hard, and close grained. Quantity sold over weighbridges, 11½ cwt. per ton of coal carbonized; or, adding that used for fuel, a total of about 14 cwt. per ton.

Tar and ammonia, similar in quality to the production from Durham coal; but the tar is rather more viscous.

The coal is very clean and free from sulphur, and is readily handled in inclined retorts set at 32° angle.

CHARLES CARPENTER,
Chief Engineer.

South Metropolitan Gas Company,
709A, *Old Kent Road, S.E., Oct.* 13, 1900.

The Allowance to be Made for Fast and Slow Meters.

SIR,—I have only just seen your issues for the last few weeks, and observing the discussion upon the testing of gas-meters, I should like to make one or two observations.

First, as to the tables of percentage of error. Your correspondents are wrong in thinking these incorrect. They are not. The Sale of Gas Act, 1859, says a meter must not vary "from the true standard measure of gas more than two per centum in favour of the seller or three per centum in favour of the consumer."

What the table gives is the figure of percentage of variation from the true standard—*i.e.*, the gasholder. Thus, if a meter indicates 100 cubic feet when only 95 feet have been passed, that meter, according to the Sale of Gas Act (and the tables) is 5·26 fast (5 feet in 95). This is surely the only reasonable way in which a thing can be compared to a standard—*i.e.*, in the percentage of that standard. If it were practicable to shut off the meter when 100 cubic feet had passed on the holder, it is obvious that the reading on the meter index would be 105·26, or 5·26 fast as compared with the standard 100 feet. When it comes to using this table as a means for correcting an account which has been paid upon the reading of the index, this is, of course, another matter, and is not the purpose for which the tables are intended. A correct calculation can, however, easily be made in such a case as that pointed out by "B. R. P."

What I wish to make clear is that the tables (for which, by the way, the late Mr. F. W. Hartley was not responsible) are correct according to the Sale of Gas Act, for which purpose they are intended. They were compiled by the Metropolitan Board of Works.

As to corrections for temperature, Mr. Hartley, in a later edition of his "Gas Measurement," put the thing in a very concise and correct manner; and these instructions are embodied in the new edition.

JACQUES ABADY.

Westminster, S.W., Oct. 11, 1900.

LEGAL INTELLIGENCE.

Compensation to a Beckton Gas Stoker.

At the Woolwich County Court last Wednesday, his Honour Judge Addison, Q.C., had before him the case of *Albert v. The Gaslight and Coke Company*. It was an action brought under the Employers' Liability Act to recover compensation for injuries received by a stoker through the alleged negligence of the Company in providing defective appliances. Mr. F. Watt appeared for the plaintiff; Mr. Lochouse represented the defendants. Plaintiff's case was that he had been in the employ of the Company 26 years, and on the 26th of March was at work charging the retorts by a stoking-machine which travelled, loaded with coal, over rails. The machine should have had a guard on each side, so as to knock away any obstruction on the rails. Plaintiff had his foot on the line, and if there had been a guard, it would have pushed his foot away; whereas the wheel passed over it, inflicting permanent injury. He was six weeks in the Seamen's Branch Hospital; two of the outer bones of the foot having sustained compound comminuted fractures. The wound had healed; but the injury to the tendon of the foot was permanent. He used to be paid 5s. 9d. a day; but since August he had been taken back into the service of the Company at a reduced rate of wages—viz., 4s. a day. He was unable to work at the retorts, and did odd jobs in the yard. He had a wife and twelve children. He and most of the witnesses were Germans. For the defence, it was stated that the mechanical stoker moved very slowly (at the rate of a mile in 1½ hours), allowing ample time for the plaintiff to remove his foot out of danger. The machine had guards when the accident occurred—in fact, it was just the same then as now. There were 48 machines at work at Beckton. The guard left a space of ½ inch between it and the rail; and plaintiff probably got his foot in. It was urged that there was no defect in the appliance, and no fault on the part of the Company. His Honour gave judgment to the effect that the plaintiff was to be paid 10s. 6d. a week, the difference between the old and the present wages.

Record Water Consumption in the Tees Valley.—During the week ending Sept. 29, a record was made in the quantity of water supplied by meter in the Tees Valley Water Board's district—viz., 69,201,000 gallons. The previous highest record was 68,000,000 gallons in a week, when the Middlesbrough Corporation required 3,000,000 gallons for filling a large gasholder tank. The ordinary consumption for the week ending Sept. 29 was 20,000,000 gallons; bringing the total to 89,208,000 gallons.

MISCELLANEOUS NEWS.

THE POSITION AND EXTENSION OF THE CARLISLE CORPORATION GAS-WORKS.

Report by Mr. Corbet Woodall.

The minutes presented by the Gas Committee at the Meeting of the Carlisle City Council last Tuesday, contained a report by Mr. Corbet Woodall on the question of the extension of the gas-works, as well as one (dated April 30 last) by Mr. C. B. Newton to the Gas Committee. Mr. Newton's report was of some length; and in it he laid stress upon the need for an increase of the manufacturing plant at the gas-works, and advised that the extensions be made at Boustead's Grassing—the first instalment to consist of plant for the production of 500,000 cubic feet per day, at an estimated cost of £33,000. Owing to the importance of the question, the Committee are going to hold a special meeting to consider it.

The following is the full text of Mr. Woodall's report, excepting the introductory paragraph:—

The position with regard to the gas works and supply is as follows: The demand for gas has overtaken the productive capacity of the plant at the gas-works; it has, indeed, considerably passed that capacity. I am informed that for two winters all the retorts have been in full work, and that only by the limitation of pressure, involving as it must have done some inconvenience to consumers, has the catastrophe of a total extinction of the lights been avoided. No gas undertaking is in a safe condition which has not a reserve of retorts in hand in midwinter. In your case there was no such reserve; and the whole number when doing their best could not furnish sufficient gas to meet the demand. If inconvenience was felt last winter, the same must be experienced to a greater extent in the winter coming, because the demand is increasing; and no provision whatever has been, or can now be, made this year to meet it.

The growth of the business is shown by the following table:—

Year.	Gas Made. Thousands.	Increase. Total.	Increase. Per Cent.	Make. Per Ton.	No. Consumers.
1894 ..	232,790				
1895 ..	250,154 ..	17,364 ..	7·45 ..	10,713 ..	7347
1896 ..	260,423 ..	10,269 ..	4·10 ..	10,778 ..	7705
1897 ..	275,539 ..	15,116 ..	5·80 ..	10,525 ..	8450
1898 ..	282,278 ..	6,739 ..	2·44 ..	10,729 ..	8633
1899 ..	297,742 ..	15,464 ..	5·48 ..	10,480 ..	9150

From this it appears that, notwithstanding efforts to check the supply, the increased make last year was rather in excess of the average for the past five years. It is desirable to bear in mind that, if the demand grows at an average rate of 5 per cent. compound, the output must double in fourteen years. There can be no doubt that extensions of the producing plant are already considerably overdue.

Choice of three courses has been put before the Committee by which the needed power may be obtained. These three practically cover the possibilities available. They are: (1) An extension of the short retort-house so as to increase the facilities for the making of coal gas. (2) The erection of a plant for the manufacture of carburetted water gas as a supplement to the existing coal-gas apparatus. (3) The erection on the land at Boustead's Grassing of works and plant supplemental at first to the existing works, but extended later so as to provide for the whole supply.

Dealing with these in order, I have no hesitation in saying that the first is open to such grave objections that it is practically impossible. Already the site of the works is fully occupied. A gas-works requires, in addition to the space for plant, a considerable (proportionate) area for the storing of coal, the handling of materials, and for treating and storing coke. The absence of room for the latter is one of the greatest of the present difficulties. Now if additional retorts are built, these will not only occupy space difficult to find, but they will also require an increase of coal storage, and they will add to the quantity of coke to be dealt with. Having regard to the situation of the works and to its already congested condition, any increase of the output of coal gas will inevitably make the works a nuisance, and their removal a necessity. This method, then, should not be adopted.

The carburetted water-gas system has great advantages, where, as in your case, space is limited; among others: (*a*) The area occupied by the producing plant is much less than is necessary for coal-gas retorts of the same power. (*b*) As no coal is used, it is not necessary to provide coal-stores. (*c*) The process does not produce coke, but consumes it. If the demand for coke is slack, and the disposal of it difficult, carburetted water gas provides a welcome outlet for the surplus. (*d*) The cost of the plant is considerably less than that for coal gas. (*e*) The use of cannel might be discontinued, cheaper coal gas made, and the enrichment to the quality required effected economically by the carburetted water gas. (*f*) The actual cost of making a mixed gas of 20-candle power will be less at present prices than if cannel and coal only are employed. These conditions need no enforcement. If the quantity of gas required is to be provided at the present works, carburetted water gas offers the only, and at the same time efficient and economical, method of producing it.

Mr. Woodall next discusses the question of the removal of the works. He says: If the demand for gas continues to grow rapidly, the necessity for this drastic measure will have shortly to be considered. I do not think you should count upon adding more than 60 per cent. to the producing capacity of the works by means of carburetted water gas; and bearing in mind that there is a deficiency now of 10 per cent., such an addition would be exhausted in about five years. The proposal to erect a retort-house and plant for making a million feet daily at Boustead's Grassing, and to set retorts at first equal to half-a-million, keeping both works in action through the greater part, if not the whole, of the year, does not commend itself to me. I would much prefer to see complete works for at least a million erected straight away whenever the new station is decided upon. My reason is that such works would supply all the gas required through about eight months of the year, during which the old works could be closed down. During the winter months the excess could be made at the old works, and only a comparatively inexpensive staff would be required there. The cost of completing the works would be about £5000

only—a sum not worth considering when it is remembered that the first half million will cost over £30,000. Considerable extra cost will attach to the running of two works together for a business such as yours. I would advise, therefore, that no important renewals should be made at the old works after the new is decided upon, but that the whole of the manufacture should be concentrated on the new site as the old apparatus is worn out.

Whenever a new manufacturing station is built, I would advise that it be placed as far away from the town as possible. The land at Boustead's Grassing which has already been scheduled for the purpose is, in this respect, not suitable. While it is considerably further from the populous part of the city than are the present works, it is yet so close that it will shortly be reached and passed by houses. I would strongly advise that new land be scheduled, of that held by the Council, at the greatest distance possible. The question of the interference by the present works with the amenities of the city is one upon which the Council are the best judges, and need no outside advice. That removal must take place within a comparatively short term of years is extremely probable; and it is for the Committee to decide whether, under the circumstances, more money should be spent on the old works.

If my view as to the situation of new works commends itself to the Committee, then it follows that, as parliamentary powers are necessary for the acquisition of additional land, it will not be possible to start new works for at least a year, or to have them ready for use before the winter 1902-3. This is too long a period to wait; and, in my opinion, the circumstances all point to the wisdom of erecting carburetted water-gas plant at once, and making preparation for the removal of the works within possibly five or six years. An alternative to this plan would be to leave the present works undisturbed, and to erect a carburetted water-gas plant at the Grassing immediately; letting the removal wait to an indefinite period.

The reasons I have given against erecting a section of coal-gas plant are two—first, that a retort-house should not be placed so near the town, but should be pushed as far to the south as possible, necessitating further parliamentary powers and consequent delay; second, that assuming the Committee to be content with the land they have, a retort-bench, if erected, would need to be worked practically all through the year; and this would involve either (*a*) the carrying on of two stations or the concentration of the whole work, with the necessary large expenditure of capital, on the Grassing land. Neither of these objections would attach to the erection of the carburetted water-gas plant: First, the working of the plant causes no smoke, and little, if any, smell, so that it can quite safely be placed on the present land; secondly, such a plant can be lighted up and let down without suffering damage. It can, therefore, be run at such times, and for such periods, as convenience and economy dictate. This plan is, in my opinion, the best that the Committee can follow.

Apart from the present urgent need for additional works which a properly designed water-gas plant seems alone able to satisfy, such a plant will be of decided value to the undertaking. I have named some of its advantages earlier in this report, and to have the alternative in times of high-priced coal of calling in the aid of oil palpably strengthens the position of the Committee. It would be necessary to transport the necessary coke from the Citadel to the Grassing; but this would not be a heavy charge. The plan proposed will make the first cost slightly heavier than if the plant were erected on the old works. A new building must be erected for the generating plant, and a small relief holder will be needed. On the other hand, a building properly designed will be more convenient than the cramped space proposed to be used, and the small holder will cost less than the value of the old one which it was proposed to adopt, and which would be withdrawn from the present storage capacity. There would be no objection to the erection of the purifiers necessary for the carburetted water gas on the land now available at the Grassing. If the Committee decide to confine the works to the present site, then I would advise that the present condensers be removed and a coke yard or store formed at the north end of the small retort-house.

THE SHREWSBURY CORPORATION AND THE GAS COMPANY.

Suggested Purchase of the Gas-Works.

At the Meeting of the Shrewsbury Town Council on Monday last week—the Mayor (Mr. R. S. Hughes) in the chair—the preliminary skirmish took place in what may possibly be one of the leading contests in the first session of the new Parliament. It arose on a letter which had been received from Messrs. Stevenson and Burstal (who, it may be remembered, were consulted by the Corporation in connection with the arbitration proceedings early in the year with respect to the damage done to the Gas Company's mains by sewerage operations), pointing out that, according to the Company's accounts for the ten years 1890 to 1899, they had apparently for many years been going on without any working capital, and had had large overdrafts from their bankers. They ought, it was urged, some time ago to have called up their remaining authorized capital, and used it for trading purposes, instead of paying high interest to the bank. Another point which the writers thought required elucidation was that during the years 1891 to 1899 the Company did not spend anything on works out of capital; for it was quite beyond belief that in this time they had not done anything to extend their works, mains, or meters. The only solution which could be offered was that whatever extensions had been made were paid for out of revenue. This conclusion was, they said, borne out by the fact that during the years 1890 to 1899 inclusive the Company had been spending in repairs and maintenance of works and mains an average of 8·78d. per 1000 cubic feet of gas sold. In an undertaking of this size and description, it should be difficult to spend as much as 5d. per 1000 cubic feet on the average of the years; and therefore the balance of 3¾d. would in all probability be used in providing extensions of works, mains, service-pipes, and meters, and possibly also a portion of the 5d. allocated as the full amount which ought to be laid out upon repairs and renewals. There was no doubt whatever in the writers' minds that had the Company been working under a standard price and a sliding-scale instead of a maximum price and a maximum dividend, they would have reduced the price of gas materially; and, indeed, had only a proper amount been expended upon repairs and renewals, the price would have had to be reduced at least 3d. or 4d. per 1000 cubic feet. They went on to say that the Company had come to the end of their capital, and must in a very short time apply to Parliament for further powers. It was a matter, therefore, for the Corporation to consider whether, as they were the owners of the electric lighting plant and the water-works, and thus had absolute control over the streets, with the exception of the gas-mains, it would not be advisable, from this point of view alone, to acquire the gas undertaking. The Corporation were in an exceptionally good position now to secure it, if they desired to do so; and, indeed, it would be better for them to purchase now than at a later period. There was no doubt in the writers' minds that it would be greatly to the advantage of the town if the undertaking were in the hands of the Corporation; and they thought the present was an opportunity which would not return for many years. Purchase by the Corporation would not, they said, do any harm to the shareholders; for, as a matter of fact, in every gas purchase each shareholder had received more than the market value of his shares, unless there had been some gross mismanagement. In conclusion, Messrs. Stevenson and Burstal informed the Corporation that if they decided to acquire the Company's undertaking it would be necessary to proceed by Bill next session.

Mr. Deakin (Chairman of the Lighting Committee), dealing with the statements in the letter, said the 3¾d. per 1000 cubic feet sold, to which Messrs. Stevenson and Burstal had called attention, might not appear a matter of very great moment; but if they took into consideration the quantity of gas sold by the Company during the last ten years—viz., 1,309,691,663 cubic feet, or an average annual sale of 130,969,166 cubic feet—it represented an annual overcharge to the gas consumers of the borough and district amounting to £2046 11s. 9d. This represented an equivalent to 5d. in the pound on the borough rate, and was distinctly, if the letter was worth anything at all, an overcharge spent on improving works and property out of revenue, instead of the money coming out of capital account. It totalled up in the ten years to the large sum of £20,463 17s. 6d. This was sufficient for his purpose, which was to show the necessity for a thorough and searching investigation into the matter. If application were made to the Court of Quarter Sessions for the appointment of an accountant to investigate the Company's affairs, he believed regard would be had to this overcharge, and the Company made to refund some of the money. Alluding to the recommendation to the Corporation to purchase the gas undertaking, he remarked that this was a very large question; and he was not prepared to say whether or not it would be wise. However, it was clear the Company intended to apply for a new Act; and therefore he thought the Corporation should insist on having inserted therein a clause giving them power to purchase, if they desired, by arbitration or valuation. He moved that the letter be referred to the Estates and Parliamentary Committee.

Mr. Woodhouse asked with what object the question was to be investigated. Was it with the view of ultimately trying to purchase the gas-works, or of referring the matter to the Court of Quarter Sessions, and trying to get proof of the charges made in the letter? He should like to remind the Council that they had had a little experience quite recently of fighting the Gas Company.

Mr. Deakin said, with regard to the reference to Quarter Sessions, if they made out a satisfactory case to the Recorder, the payment of all costs would fall on the Company.

Mr. Woodhouse said there was a point which Mr. Deakin did not touch sufficiently. The Company had spent money in improving their property; and he thought they would be able to show that, in order to be up to-date, it was necessary for such expenditure to be incurred periodically. The Company had, within the last twenty years, appealed to the public more than once for capital, which had been subscribed and spent; so that any reference that might ultimately be made to Quarter Sessions had another side besides the one mentioned by Mr. Deakin.

Mr. How said he rather agreed with Mr. Woodhouse. He thought it should be made quite clear that the Council were not animated by any feeling against the Company, but only with the desire to protect the ratepayers.

Mr. Deakin, in reply, said he did not propose to rush into hostile litigation, or anything of the kind; but he considered he should be failing in his duty as Chairman of the Lighting Committee, if a letter such as the one they had before them, came to him, and he did not submit it to the Council. It never occurred to him that there was any rivalry between the Company and the electric light undertaking. The electric light was making very satisfactory progress indeed; but he was sure it would never do the gas undertaking any harm. The more electric light was used, the more gas was sold. This was the case in every instance. If this question were referred to the Committee, it should not be simply for them to watch the new Bill, but for the purpose of considering the whole subject.

The letter was unanimously referred to the Committee.

Commenting upon the proceedings above reported, the "Shrewsbury Chronicle" says: "The Estates and Parliamentary Committee should proceed with their deliberations promptly, but warily, remembering that not so very long ago the Corporation tried a fall with the Gas Company, and came out of it very badly. The firm of Engineers advise the Shrewsbury Corporation that now is a very favourable time to purchase the Gas Company's undertaking, and they give certain reasons for their recommendation, not the least potent of them being the intention of the Company to apply for further powers in the next session of Parliament. It would doubtless be a good thing to acquire control of the gas supply of the town, because it ought to be possible to purchase, at a valuation or by arbitration, on such terms as would ultimately make the investment a paying one for the town. But the Council are hampered by other heavy responsibilities; and it is doubtful whether a policy of purchase would have the support of the majority of the ratepayers at the present time. Already the public debt is very heavy, and the water supply problem still awaits solution; and, fearful that for some years at least the gas-works might be a burden and not a profit, the ratepayers will probably hesitate before they endorse their purchase. The suggestion that the Town Council should watch the Company's Bill, and endeavour to get a clause inserted giving power to purchase on equitable terms, is, however, one that is well worth consideration. The expense would not be great, and the position of the Council would be immensely improved if at any subsequent period they resolved to buy."

METROPOLIS GAS SUPPLY.

Dr. A. W. Williamson's Quarterly Report.

The following is an extract from the report of Dr. A. W. Williamson, F.R.S., the Chief Gas Examiner for the Metropolis, on the quality of the gas supplied to London during the quarter ended the 30th ult.

I.—*Illuminating Power.* The average illuminating power in standard sperm candles at each of the testing-places was as follows :—

The Gaslight and Coke Company—	
Fenchurch Street, E.C.	17·0
Kinghorn Street, Cloth Fair, E.C.	16·6
Dorset Build ngs, E.C.	16·4
Ladbroke Grove, W.	16·6
Vincent Terrace, N.	17 0
Carlyle Square, Chelsea	16·2
Camden Street, N.W.	16 4
Graham Road, Dalston	16·7
Kingsland Road, E.	17·2
Vinery Villas, St. John's Wood	16·9
Lambeth Road, S.E.	16·3
Hornsey Road, N.	16·6
George Street, Hampstead	16·6
Commercial Gas Company—	
Wellclose Square, E.	16 6
Parnell Road, Old Ford	16·8
South Metropolitan Gas Company—	
Hill Street, Peckham	16·9
Bedford Road, Clapham	16·4
Stoney Lane, Tooley Street, S.E.	16·6
Lewisham Road, S.E.	16 8
Blackfriars Road, S.E.	16 6
Burrage Road, S.E.	16 7

It will be seen from these results that the average illuminating power was higher than the parliamentary standard—16 candles—at all the testing-stations. The following were the only deficiencies reported during the quarter: Carlyle Square, on July 2, 15·83 candles; Bedford Road, Clapham, on Aug. 2, 15 88 cand'es.

II.—*Purity.* The presence of sulphuretted hydrogen in the gas on any day was not reported during the quarter, except on one occasion—viz., on July 14 at Lambeth Road. The average amount of sulphur in other forms than this was considerably less than the quantity permitted—17 grains—at all the testing-stations. Several excesses of sulphur in the gas made by the South Metropolitan Company were reported during the quarter by the Official Gas Examiners. Ammonia was generally present in the gas more or less frequently during the quarter, but only in slight quantities. The amount allowed—4 grains—was not exceeded at any of the testing-places.

BIRMINGHAM CORPORATION GAS SUPPLY.

The Extensions at Nechells.

Last Thursday, the Chairman (Mr. J. H. Lloyd) and members of the Gas Committee of the Birmingham City Council were afforded an opportunity of inspecting the additions which are being made to the gas-works at Nechells, at a cost of about £250,000. These extensions, which are being carried out to the plans and under the superintendence of Mr. Henry Hack, M.Inst.C.E., were described in the "JOURNAL" for Oct. 18, 1898. The works as they stood before the latest addition was undertaken – Saltley and Nechells combined—were capable of turning out daily 10¼ million cubic feet of coal gas and 4 million cubic feet of carburetted water gas. The extensions, which are expected to be completed in time for the work of the coming winter, will give an additional producing power of 5 million cubic feet of coal gas and 2 million cubic feet of carburetted water gas. But this full advantage will not be apparent just yet; for while the new plant is being erected, it is the intention of the Committee to demolish two of the older retort-houses and reconstruct them. It is estimated that this will mean in the coming winter a reduction of the present producing power of 10¼ to 8 million cubic feet. This represents the demolition of one old retort-house; the second will share the same fate later on.

The principal new feature in the works at Nechells is the gigantic retort-house, 324 feet long and 114 feet wide, consisting of four benches, each of 13 beds of eight retorts on the inclined system (the angle being 32°); giving in all 416 retorts. All the settings are on the regenerative principle, after the Salford model. The benches are arranged for the charging to be done from the middle of the house, and the discharging towards the outer side walls, in order that there may be plenty of air where the hot coke falls. This is a point on which, characteristically, Mr. Hack has considered the comfort of his men. The width of the staging in the middle of the house, between the two lines of benches, forming the charging-floor, is 40 feet; and there is a railed-off central opening to the coke-floor level, extending nearly the whole length of the house. The height of the retort-house, from the coke-floor level to the discharging-floors at the sides of the house, is 12 feet. The charging-floor in the middle is 13 feet higher; and the height of the roof from the coke-floor is 64 feet. The loftiness and open structure of the roof, the openings in the charging-floor, and the arrangement of the discharging-floor, make the retort-house one of the best ventilated and the coolest in England. When the installation is finished, the coke from the retorts will be removed by a De Brouwer conveyor.

From the new retort-house the gas will be conveyed by a 36-inch main to the purifying plant, which is now in course of erection, but will not be completed for another year or so—a portion of the work having been postponed in consequence of the present high cost of material and labour. Other accessories bring the cost of the new producing plant to about £150,000. The necessary additional storage, represented by two gas-holders on the Nechells side—one holding 4 million cubic feet and the other 8¼ millions—accounts for the balance of £100,000. In addition to the work now being done at Saltley, Mr. Hack is superintending the erection at the Swan Village works of carburetted water-gas plant to produce 1½ million cubic feet of gas per day. At present, the total producing power of all the Corporation gas-works is about 36 millions daily, which represents roughly an average day's consumption.

THE LONDON COUNTY COUNCIL AND GAS AND WATER QUESTIONS.

The first Meeting of the London County Council after the summer recess was held last Tuesday, when the Chairman (Mr. W. H. Dickinson), as usual on the resumption of the sittings of the Council, addressed the members on the work of the various Committees during the year ending the 31st of March last.

Referring to the operations of the Public Control Committee, he remarked that the subject of the method of testing gas had engaged much of the Committee's attention. The experience of the Council's officers, which had been very extensive, showed that in 90 per cent. of the tests made by the portable photometer the illuminating power of the gas, as supplied to the consumer in London, was below the legal standard, and this notwithstanding the fact that the gas, as tested at the fixed stations, complied with the requirements of the law. This discrepancy appeared to call for correction; and accordingly the Committee advised the Council to seek powers to enable them to test the gas at other places than the testing-stations, by means of the portable photometer. The Bill introduced by the Council for this purpose had, however, been rejected by a Committee of the House of Commons, on the ground, he presumed, that the tests might be taken in unsuitable premises, and therefore be unreliable. He hoped the Committee might devise some scheme which would meet this objection, and enable the Council to be more successful in their next application to Parliament. In the meantime, they had resolved to ask the Board of Trade to institute an inquiry in order to ascertain what was the true cause of the serious difference in the quality of the gas when tested at fixed stations and when tested by the portable photometer.

With regard to the Parliamentary Committee, in addition to their ordinary duties, they last year had to arrange for the Council's evidence being taken before the Select Committee of the House of Commons specially appointed for the purpose of inquiring into the powers of charge of the Metropolitan Gas Companies. The Council's case against the Companies was fully established, and the report of the Select Committee contained some important recommendations for reducing the standard price of the gas supplied by the Gaslight and Coke Company and other Companies, for altering the sliding scale, for transferring the Gaslight and Coke Company's area south of the Thames to the South Metropolitan Gas Company, and for regulating the charges for gas supplied through automatic meters. The Bill promoted by the Council for legalizing the use of the portable photometer was eviscerated by the omission of its principal proposal; but it passed into law for the purpose of effecting certain restrictions upon the Gas Companies in their power of charging for the use of prepayment meters.

Coming to the work of the Water Committee, he said that they were evidently convinced that some comprehensive scheme for amplifying the supply of water to London was urgently needed. They did not believe that the Water Companies' plan of constructing enormous reservoirs in the neighbourhood of Staines, and storing therein the winter floods of the Thames, could ever be anything but a stopgap. They presented a most instructive table showing what the natural flow of the river had been from May to December in the years 1898 and 1899, as compared with the average flow over a period of 17 years. From this it appeared that, while the average daily flow in September had been 491,500,000 gallons, that in September, 1898, was only 213,400,000 gallons; and while the average in August had been 472,900,000 gallons, the flow in August, 1899, was only 231,100,000 gallons. When it was borne in mind that the Balfour Commission reported that London would, within 31 years from now, require to draw 300,000,000 gallons of water daily from the Thames, and that, in the opinion of the Commission, at least 200,000,000 gallons should be left at all times to flow down the river, it was clear not only that the amount of reservoir accommodation necessary for storing the winter floods in sufficient quantity to provide for summers like those of 1898 and 1899 would be far greater and far more costly than the Balfour Commission ever suspected, but also that in the end London would be compelled to resort to new sources at much greater expense than if this were undertaken now. He believed that, if the present opportunity were lost, future generations would look back to their action with much the same feeling of regret as that which had been expressed at the action of the City of London when, in 1612, it gave over the control of the New River undertaking to private hands.

LOCAL AUTHORITIES AS COLLIERY OWNERS.

The Bradford City Council Affirm the Principle.

In accordance with notice, Mr. E. R. Hartley last Tuesday invited the attention of the Bradford City Council to the following resolution: "That, in the opinion of this Council, it is desirable that the Corporation should have control of the supply of coal required by the Corporation for use in their various undertakings, and that it be an instruction to the Town Clerk to insert in the Bill to be promoted in the next session of Parliament a clause empowering the Corporation to become the owners of, and to work, a colliery or collieries, with power to borrow the necessary moneys required."

Mr. HARTLEY, in submitting his proposition, proceeded on the assumption that the advance in the price of coal amounted to about 5s. per ton which, he said, was a very moderate estimate, having regard to the actual increase which had been enforced. The additional price on the quantity of coal consumed by the Corporation was equal to a rate of about 10d. in the pound. The consumption of coal in the whole city was estimated at 1,500,000 tons a year, so that the people of Bradford would, at present prices, pay an extra £375,000 a year. The total sum received in rates by the Corporation was about £400,000 a year; and he asked the Council to try to imagine the situation which would be created if the rates were doubled. Really, the increase had crept along so insidiously that consumers had scarcely realized the full gravity of the position. A statement had been made that an increase of £7000 in the charges for water would drive the trade out of Bradford; and if half the coal consumed in the city was required for trade purposes, the outlook must become positively alarming when a tax of something like £200,000

was imposed. There was really nothing new in the acceptance of such a principle as that contained in the resolution. It was a step in the right direction; and after a supply had been secured to fulfil the needs of the Corporation, he was sure the undertaking would prove so successful that action would be taken to provide the whole city with a municipal coal supply. The burden had become intolerable, and no one realized it more than a business man. Asking why coal had increased in price, he said the output was greater than usual; and it could not be traced to any marked advance in the wages of the colliers. Both arguments were false. The plain truth was that a comparatively few people had obtained a monopoly of one of the natural resources; and they were taking advantage of their position while the attention of the people of this country was directed away from affairs at home. The increase in the price of coal to the nation was nearly equal to the whole of the national revenue. It was certain that unless the people secured possession of that terrible monopoly, it would crush their industries almost out of existence.

Alderman Wood seconded the proposition.

Mr. Land opposed the resolution from a business point of view. Admitting that it was an outrage on both large and small consumers that they should be charged such high rates for coal, he said he could not see how the Manchester, Glasgow, Bradford, or any other Corporation could attempt, with any prospect of success, to provide their own coal supply with one or two collieries. Even in the case of the Gas Department, it would be dangerous to have to rely upon half-a-dozen or even a dozen collieries, considering the risks of labour troubles—in fact, the Gas Department had purposely contracted to be supplied from at least twenty different collieries, in order to ensure regular delivery. He submitted that such an undertaking as that proposed would be a dangerous one for the Corporation, and he hoped they would hesitate before pledging themselves to a resolution which would undoubtedly involve an expenditure of two or three millions sterling.

Mr. J. Triffitt was likewise antagonistic. In his opinion, this was not the best time to buy a colliery; for in four or five years the cost would be £60,000 or £70,000 less.

Mr. Abram Peel considered the principle a good one, and said the movement ought to be helped.

Mr. A. Priestman observed that the combinations which were being organized all over the country, and particularly the Fine Cotton Spinners' combination, had power to purchase collieries to supply themselves cheaply with coal. These large trusts, composed of sensible business men, had come to the conclusion that they must get over the terrible monopoly which dominated the coal supply by going into colliery work themselves. If this were the case, surely the Bradford City Council ought to consider it worth while to pay some attention to the arguments which had been brought forward in support of the resolution Mr. Hartley had submitted.

The resolution was carried by a large majority.

THE ALLOCATION OF MUNICIPAL TRADING PROFITS.

At the Annual Conference of the Incorporated Society of Accountants and Auditors, held in the Town Hall, Leeds, last Thursday, a paper on the above subject was read by Mr. C. H. Wilson, a member of the Corporation.

In the course of his paper, the author said there were people who held the opinion that municipal trading concerns, such as gas, water, lighting, and traction undertakings, should not be worked to produce much profit; but he had never heard of anyone objecting to borough funds swallowing up the profits derived from market rights, cemeteries, &c. To such objectors he commended the following observations: (1) No business, municipal or otherwise, ought to be carried on at a loss; and (2) no municipal trading can be set up except with the consent, and at the cost, of the whole body of ratepayers—the cost of Acts of Parliament being almost invariably charged to the borough funds. The principal argument brought against employing municipal profits in relief of rates was that the municipalities should give consumers the benefit of all the profit made by reducing the price of the commodities or accommodation furnished. This was fallacious, for the following reasons: (1) The representatives of the ratepayers were not sent to the Council to give their time to act for consumers, but for ratepayers; (2) the workers should not be overlooked; (3) the ratepayers' credit should not be pledged for borrowing powers without some compensating advantage; (4) the city funds should not alone be charged with losses; (5) it had now been proved that corporations could supply at a better rate than companies; (6) the city fund should not be charged with the cost of obtaining powers without a compensating advantage; and (7) the ratepayers did not pay large salaries for the benefit of consumers alone. He was strongly of opinion that no more money should be extracted from the ratepayers than was absolutely necessary; and, further, that the prosperity of a town might be seriously interfered with by allowing the rates to fluctuate needlessly, as in these days, when new industries were constantly springing up, they might be frightened away from some places by such fluctuation, and others derive benefit in consequence. Another matter having an important bearing on municipal trading was the operation of the sinking funds imposed by Parliament. Sinking funds had the effect generally of rendering unnecessary the depreciations written off by private trading concerns; but, in spite of this fact, there were many members of corporations who inflicted hardship and loss on present-day ratepayers by preventing profits that would otherwise be available for aiding rates being so applied. The application of revenue profits to capital expenditure was nothing less than filching the money from present-day ratepayers, as otherwise such profits must undoubtedly be used in relief of the rates. In addition to being morally wrong, the system was also in direct conflict with the fundamental principles of the Acts under which municipal trading alone was possible. Great as had been the work of municipalities, it was by no means finished. There were many problems yet to be solved; but they could not be dealt with adequately, if the trading profits were not allocated properly, without seriously increasing the rates, which were already sufficiently high. He had always advocated the automatic passing of trading profits to the city fund. In Leeds, they had spent on capital account £4,773,991, and against this a sinking fund of £905,021 had been accumulated. Losses amounting to £36,507 had been charged to the city fund, and, on the other hand, £269,673 of profit had been used in the relief of rates, while £93,502 of revenue profits had been spent on capital account.

The discussion upon the paper was opened by Mr. G. Swainson, the Borough Treasurer of Bolton, who entered a protest against the recent action of the London Chamber of Commerce in seeking to secure a limitation of the sphere of municipal trading. Personally, he thought such trading should go a little farther. He advocated the municipal control of the milk supply. Mr. Whittaker (Southampton), on the other hand, thought there ought to be some limit placed upon municipal trading. In Southampton, they had taken to supplying "ha'porths" of tea, soap, sugar, &c., in their municipal lodging-houses. Mr. Swainson now wanted them to go in for supplying milk; but he thought a limit should be drawn there. Municipalities could better watch over the interests of a town by seeing that those who undertook to supply articles should do so properly, than if they undertook to supply them themselves. If municipalities were to conduct these gigantic businesses, they could not get councillors to devote the necessary time and care to the work without some remuneration; and, as a result, they would require men adequately paid and properly qualified to manage their business. There would be another grave danger to be guarded against—that of men yielding to the temptation, which would be always before them, to accept secret and illegal commissions. If municipalities conducting big trading concerns were managed by poor men, there would always be this temptation. Mr. Lloyd Price (Manchester) argued that, while in theory there was nothing which a municipality might not take up, the limits fixed by usage were well defined. He would divide the matters in which municipalities might engage into essential and non-essential, including under the latter heading tramways, gas, and electric lighting. He quite agreed with the author of the paper that municipalities were entitled to make profits. But there were some points to be considered. For instance, in Manchester they had an installation for supplying hydraulic power, the cost of which was borne by every ratepayer, though the number of those using the power was very small. Mr. Stapleton (Cork) considered that municipalities made a mistake in not applying ordinary business principles to their undertakings in the manner in which they ought to be applied. Mr. Blandford (London) expressed the opinion that the first charge on municipal trading ought to be the reduction of the cost, and not reduction of the rates. The Chairman (Mr. F. Walmsley) said experience showed that corporations did the work at less cost than private companies. He supported the theory that the former were entitled to trade in things which were possessed in common, such as gas and water, and also to extend to municipal enterprise the principle of accumulation and creation of profits. Mr. Wilson, in reply, said he had no sympathy with directors of railway companies sitting in the House of Commons, and using their influence to prevent municipalities from extending their tramway system. At the same time, he desired to impress on the conference that they ought to safeguard their position by showing that they did not intend to have anything to do with absurd municipal trading. There was a strong socialistic tendency throughout the country, which aimed at municipalizing everything. As accountants, they ought to stand up against this tendency; and in London especially, in connection with the establishment of the new municipalities, accountants might do much to resist it by applying themselves to public work.

COLWYN BAY DISTRICT COUNCIL PROPOSE TO PURCHASE THE GAS-WORKS.

A Special Meeting of the Colwyn Bay and Colwyn Urban District Council was held last Tuesday, to consider the question of promoting a Bill in Parliament for the transfer of the Gas Company's undertaking. Mr. G. Bevan, the Chairman, moved a resolution, authorizing the promotion of the necessary Bill. He explained that in the Gas Company's Act of 1896 the Council had five years in which they could purchase the undertaking without opposition and by valuation. The five years would expire in June next; and so it was necessary to serve the notices for a Bill in the ensuing parliamentary session. The gas-works was a very profitable undertaking; and it had grown at an enormous rate. In 1896, when the Council should have purchased the works, the output was 12 million cubic feet; while in 1899 the gas made and sold was 25 million cubic feet, so that in three years the output had more than doubled. It would therefore be very foolish if they failed to get possession of the works when they could do so at a fair price. Mr. J. Roberts, in seconding the motion, said it would be unfortunate if they had to raise the rates of the town any further; and if they had the gas profits to assist in providing the public expenditure, it would be beneficial to the whole of the district. They could also have cheaper gas, and could have full control of the public lighting. Mr. W. Davies said that last year £200 of the ratepayers' money was spent on the matter; and when the audit came, they should have that looked into. At Rhyl, it was recently said that £35,000 had been paid for what was only worth £16,000. He expected something of the same kind would occur at Colwyn Bay. The best consumers were sure to take electricity instead of gas. Why not wait a few years, and allow the competition of electricity to bring down the value of the concern. Dr. J. E. Brooks having supported the motion, the Chairman said as to the Rhyl Gas-Works purchase, there was no clause in the Act there which enabled the Council to buy at a valuation and without opposition, as was the case at Colwyn Bay. The Colwyn Bay works were practically new, and those at Rhyl were old. Even though the Rhyl Council had paid double the value—according to some people—they now made a profit of about £400 a year. The rise in the price of coal was greatly in favour of the Council. On the motion being put, only two votes were recorded against it.

The Bradford City Council last Tuesday endorsed a proposal of the Gas Committee that the wages of the purifying and yard men should be increased—the former from 6d. to 6½d. per hour, and the latter from 5½d. to 6d.

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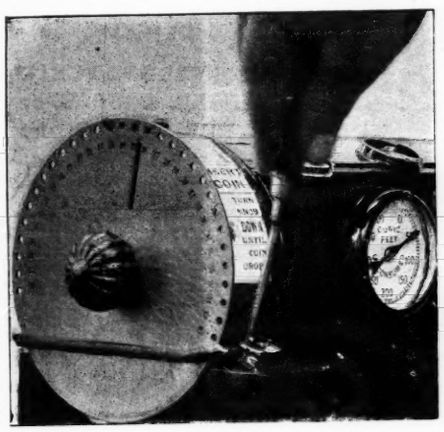

Fig. I.
Break Company's Seal and Remove Screw—THUS.

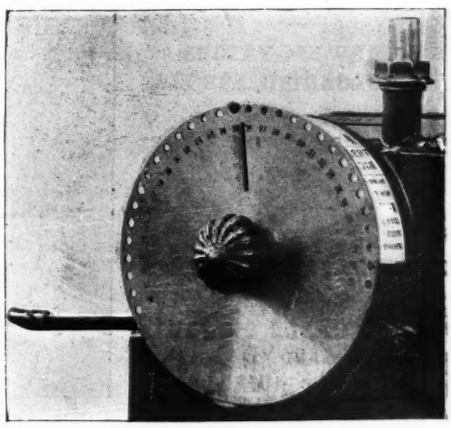

Fig. II.
Swing Band Back—THUS.

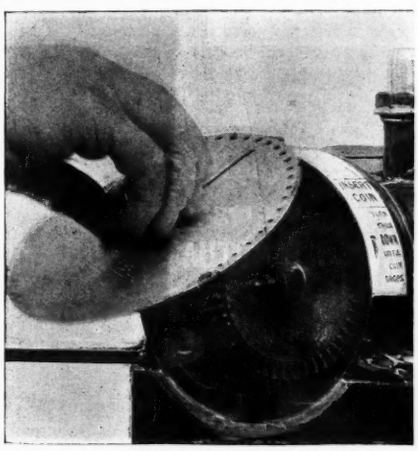

Fig. III.
Lift Plate Off—THUS.

Fig. IV.
Replace Plate—THUS.

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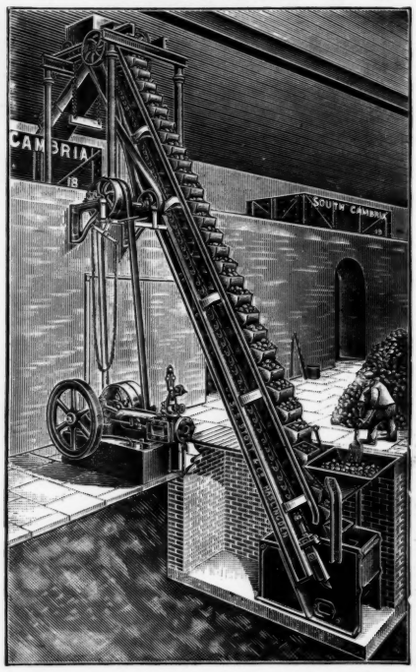

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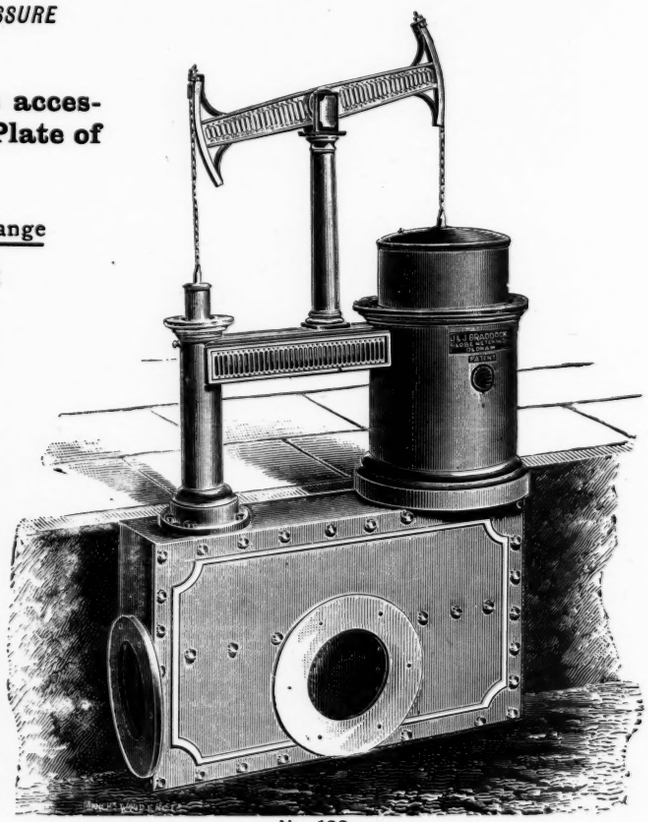

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ELECTRIC LIGHTING NOTES.

Application is to be made to the Local Government Board by the Harrogate Corporation for permission to borrow £10,000 for extensions to the buildings and plant at the electric light station.

The Rochdale Corporation electric lighting works, which have just been completed at a cost of about £30,000, commenced last Wednesday night to supply some of the shops in the principal streets.

The Stratford-on-Avon Town Council have resolved to make application for an Electric Lighting Order, and to oppose a similar proposal on the part of the United Electric Lighting and Traction Company.

At last Thursday's meeting of the Court of Common Council, the Streets Committee presented a scheme for the testing in future of all electric meters within the City, under the direction of the Electric Inspector, at the expense of the City of London Electric Lighting Company and the Charing Cross and Strand Electricity Supply Corporation; each Company to contribute, in addition to the other expenses, £200 per annum to the Corporation in respect of the Inspector's salary.

On Monday last week, the electric light undertaking of the Poplar District Board of Works, which has cost close upon £100,000, was formally inaugurated. The installation has been laid out by Mr. Alfred Blackman, formerly Electrical Engineer to the Aberdeen Corporation; and it will be carried on under his supervision. The present total capacity of the station is 32,000 8-candle power lamps; but space is left for large extensions. The arc lamps erected in the chief thoroughfares number 195; and it is proposed to convert 680 ordinary street-lamps by fitting them with incandescent electric lights. There are 65 miles of streets in the three parishes of Poplar, Bow, and Bromley; and upwards of 30 miles of mains have already been laid. Arrangements have been made with the National Electric Wiring Company for free installations for private consumers; and current will be supplied under the maximum demand system for lighting at 5d., 4d., and 3d., and for power at 3d. and 1½d. per unit. The Company who desired to light the district proposed to make charges of 7d. for lighting and 5d. for power. Arrangements are being made for the supply of meters on the "slot" system. It is stated that applications have already been received for 5000 8-candle lamps.

Last Friday, Colonel C. H. Luard, R.E., held an inquiry at the offices of the Hornsey District Council into their application for a loan of £73,500 for carrying out an electric light installation for the parish. The scheme has been prepared by Mr. R. Hammond, who has been appointed Consulting Engineer to the Council. It is on the continuous-current three-wire system—the pressure being 480 volts; and it has been approved by the Board of Trade. The feeders and distributing mains will cost about £31,000. There are seven feeding-points, totalling 15,372 yards, and 18,034 yards of distributors. The mains will be triple concentric covered cables, laid in stoneware in the footways and in iron in the roadways. The boiler plant is estimated to cost £3445, and the engine-house plant, £16,165. The two dynamos will be capable of furnishing any pressure between 480 and 550 volts, and of running up to 640 volts; and each will be able to give off, when working at any pressure between 480 and 600 volts, 300 kilowatts sustained for two hours continuously. The transformer will be capable of developing 150 ampères at 155 volts as a maximum load. The buildings will cost £8500. The public lighting is put down at £4700, and will include 94 arc lamps. Meters, connections, &c., come to £4575; and the general charges and contingencies, to £5112. The revenue from private lighting, at an average charge of 5d. per unit—say, 450,000 units—and meter-rentals is estimated at £9775; from public lighting, at £1787. The cost of generating, &c., 539,000 units at 2·25d. per unit, is reckoned at £5522; and interest and principal (say at 5¾ per cent.), at £4226. A net profit of £1764 is looked for. The buildings will adjoin the sidings of the Great Northern Railway. The population of the parish is 80,000, and the rateable value upwards of £500,000.

Gas managers who may have expected that gas would feel more keenly than electricity the effects of the present "hard times" will note with some amount of satisfaction two points in the statement made last Tuesday by Mr. T. H. Shaw, the Chairman of the Electricity Committee of the Bradford Corporation, on the results of the working of the department during the six months ending June 30. It will be remarked that the increase in the expenditure has exceeded the increase in income, and that the net profit has been reduced by £761 compared with the corresponding period of last year. Mr. Shaw said the total income for the six months was £17,723, as compared with £13,256 in the June half of last year, or an increase of £4467. The total expenditure (including interest and sinking fund) was £16,751, as against £11,523 for the corresponding period of the preceding year. The net profit was, therefore, £972, as against £1733; being a decrease of £761 on the corresponding period of the preceding year. The number of consumers was 1178, as against 965, or an increase on last year of 22 per cent. The total number of units consumed was 1,449,409, against 996,807, or an increase of 45 per cent. (irrespective of current supplied for public lamps). The total profit since the opening of the works (in September, 1899) to June 30 last, after paying interest and sinking fund, amounted to £26,986; and the amount written off for depreciation had been £14,372—leaving the sum of £12,613 to be appropriated as the Council might direct. The trade profit—that was the profit before charging interest and sinking fund—for the half year worked out to £3 7s. 2d. per cent., on a capital outlay of £241,838; and the net profit—*i.e.*, after charging interest and sinking fund—showed a percentage of 8s. on the same outlay. Taking the June half year and the preceding December half year together, the trade profit amounted to £18,186; representing £7 10s. 5d. per cent. on the capital outlay. The net profit for the same half years amounted to £4369, and represented £1 16s. 2d. per cent. on the capital outlay.

The report which Mr. S. E. Fedden, the Sheffield Corporation Electrical Engineer, presented to his Committee, and which we noticed in the "JOURNAL" for the 4th ult., has been under the consideration of Mr. Robert Hammond, and he has commented thereon. It will be recollected that Mr. Fedden generally discussed the question of the electrical supply of the city; but of present importance was his recommendation that an estimated sum of £41,895 should be spent upon additions and alterations. He also advised that the erection of a larger station should be taken in hand without delay. The effect of Mr. Hammond's report is a complete agreement with the views of Mr. Fedden as to the plan to be adopted. One of the interesting points is that Mr. Hammond is in entire accord with Mr. Fedden as to the advisability of putting the works in a position to supply electrical energy, at a low rate, suitable for motive power. While not sharing the opinion of the promoters of Power Bills that electrical energy will be adopted by large steam users in preference to steam, Mr. Hammond is decidedly of opinion that there is a very large field for the substitution of electrical energy for steam in a host of small industries, and this opinion has recently been confirmed by a visit which he has made to the principal cities on the Continent. He suggests that in applying to the Local Government Board provision should be made for a capital outlay on motors, in order to put the Corporation in a position to let them out on hire—a plan which, he says, has met with great success in Bradford. As the earliest possible delivery of plant is highly important, Mr. Hammond advises the Corporation to endeavour to secure one, or, if possible, two, of the sets at present in use at the Paris Exhibition. While agreeing with Mr. Fedden that the carrying out of his scheme will put the present works on a footing to give the best possible results as a whole, Mr. Hammond is glad to note that he is not content to stop at that consummation, and that he is preparing designs for polyphase works on completely modern lines, which will form, as the demands of the customers require, an excellent supplement to the present works. He hopes that the advisability of dealing with the public lighting is still having the attention of the Electricity Committee, as this would form a profitable adjunct to the existing business. The report was considered at the last meeting of the Committee, but nothing was decided in regard thereto. It was stated that the deputation appointed at the last meeting had concluded that it was unnecessary to make the proposed visit to Paris, and that Mr. Fedden had gone alone to the Exhibition, and also to Nuremburg and Frankfort.

A few months ago, the Town Clerk of Kingston-on-Thames (Mr. H. A. Winser) wrote to the Surrey County Council a letter in the course of which he stated that the Corporation had "the strongest possible desire to construct and work electric tramways for the borough;" and he cited "the successful management of their electrical undertaking by the Corporation" in proof of "their capacity to establish and work in connection with it a successful tramway system." A local resident examines these statements in a letter to the "Surrey Comet." He points out that when it was proposed to establish electric lighting works, it was held out that the scheme would not only prove a great boon, but that the profit would undoubtedly be a substantial relief to the rates; and the Chairman of the Tramways Committee makes use of the same argument in favour of the Corporation working the tramways. Having heard doubt expressed as to the pecuniary benefit derived from the electric light undertaking, the correspondent in question examined the accounts as published by the Corporation, and found that the following loans had been raised for 25 years: In 1893, £10,000; in 1894, £6000; in 1895, £7772; and in 1898, £19,654—making a total of £43,426. In addition to these, the Corporation have obtained power to raise £20,000 more. Of the larger total, £5094 has been repaid; leaving a balance of £38,332. The capital expenditure to March, 1900, was £50,674; and the working from 1895 to 1899 resulted in a total deficit of £6365. Deducting £4837, principal paid off, there is left a net deficit of £1528. No provision has been made for the renewal of machinery, &c., which has now been in use for upwards of five years. The correspondent made many inquiries as to what this should be, and found from experts of many years' standing that the "life" of machinery is sixteen or seventeen years, and that consequently it should be at least 6 per cent. on plant and electric appliances, except cables, upon which it should be 5 per cent. To simplify matters, he takes the whole at 5 per cent., with this result—

	Capital Outlay.	Depreciation at 5 per cent.
To March, 1895	£19,505	£975
„ 1896	22,680	1134
„ 1897	27,733	1386
„ 1898	35,598	1780
„ 1899	39,693	1985
Total		£7260
Add depreciation of building (cost £7975)		112
Add net deficit, as above		1528
Total		£8900
Or a net loss per annum of		£1780

The writer of the letter points out that the works have been in operation between five and six years, and that consequently in about twelve years the machinery must be replaced by new. Unless, therefore, a fund for depreciation is established, the cost of such machinery must be defrayed by a further loan. If the further £20,000 for which powers have been obtained is expended, another £700 to £1000 per annum must be added to the £1780. He thinks it will be confessed that these figures are not calculated to induce the burgesses to extend their municipal trading to tramways.

The Town Clerk of Canterbury (Mr. Henry Fielding) has a conscientious regard for the pockets of those whom he serves; and it is plain that he takes something more than a superficial interest in the work which comes to his hand. Electric light works, like gas and water concerns, are having experience of the vagaries of rating authorities; and the Canterbury electricity and refuse destructor installations are instances. The valuer for the Guardians has put the assessment for the electric light works at £700, and for the refuse destructor at £230; while the valuer for the Corporation says that £300 and £120 are the proper respective figures. Against the Guardians' assessment, the Corporation Electric Light Committee determined to recommend the Council to appeal; but, with a view to, as much as possible, do away with any friction which might unhappily be provoked—and which ought not to exist between two bodies such as the Corporation and Guardians of Canterbury—the Town Clerk has taken a step which should give universal satisfaction in the city. To the Town Clerk, it was obvious that the two valuers had adopted different systems of arriving at the assessment, and equally obvious that there can only be one correct method. He fully recognizes that it is only fair that the property should be assessed at its proper value, and says that the Council have no desire for preferential treatment. Then the only point at issue between the Corporation and the Guardians appears to be, what is the "correct method" of assessment; and, in the interests of both parties, and to prevent a

recurrence of dispute, Mr. Fielding has suggested to the Guardians that the system of arriving at the assessment and rateable values should be defined and adopted once and for all, and that to produce this desirable result recourse should be had to arbitration. The Guardians see the wisdom of the Town Clerk's suggestion, and have acceded to it. But they propose that, prior to the matter going to arbitration, the present valuers should meet, and try to come to an arrangement on their figures; and, failing a settlement satisfactory to both authorities, then an arbitrator should be appointed, whose decision should be final. With regard to the suggested reference to the present valuers, so far as we can see, no good, lasting result could ensue from it, as both gentlemen have already committed themselves. However, at a recent meeting, the Town Council endorsed the enlightened action of the Town Clerk, and passed a resolution on the subject, by which they agree to abide by the decisions of an arbitration as to the present assessment and as to the method to be adopted in the future. The resolution also provided for the drawing up of an agreement for reference, and the Town Clerk suggested that the choice of an arbitrator be left in the hands of the President of the Institution of Civil Engineers. If now the rating of the Canterbury electricity works is not put on a satisfactory basis, and expensive litigation arises, the fault will rest with the Guardians.

PROPOSED PURCHASE OF THE FALMOUTH WATER-WORKS.

It has been decided by the Falmouth Corporation to lay before the ratepayers a proposal for the acquisition of the water-works, based upon Mr. Phillips's report—*ante*, p. 789. A meeting of the Town Council on the subject was held last Tuesday. A report was presented by the Water Committee which summarized the criticism of Mr. Phillips on the present supply as follows: (1) The sources of the streams are liable to pollution with most objectionable matter; and the streams are further liable to serious risk of contamination at various places on their way to the reservoir. (2) The provision for filtration is inadequate, and the arrangements unsatisfactory. (3) The Company have not given a constant supply of water, the service—more especially in the higher parts of the town—being insufficient and intermittent. Throughout the summer, water is frequently turned off the whole of the high-level system during the night, and sometimes on the low-level system during the day. (4) It is generally admitted that the water is liable to pollution through insuction when the supply is intermittent. (5) The pressure of water and the supply from some of the hydrants is not sufficient in case of fire. (6) The storage is insufficient to provide for dry seasons; and some of the mains are too small to provide an adequate supply. The Committee were of opinion that there was little or any chance of the Company taking the steps necessary to remove these objections; and, therefore, the only hope of this being attained, and the water supply placed on a thoroughly efficient and satisfactory basis, was dependent on the undertaking becoming the property of the ratepayers. Mr. Phillips was of opinion that, in view of the great dissatisfaction which exists, Parliament would grant the Corporation power to acquire the undertaking. As to the works needed to improve the supply, some of them might be postponed; but the filter-beds and storage-tanks must be enlarged and improved, and the distribution pipes cleaned and enlarged where necessary. His estimate of the cost of the undertaking and the more immediate improvements was £74,500; and although the outlay of this sum would probably be attended by an increased charge on the rates for the present, the Committee considered that the benefits to be derived would more than compensate for this.

The Mayor (Alderman F. G. Bowles), in order to bring the matter before the ratepayers, moved that a Bill be promoted for the purchase of the water-works.

Dr. Banks, in seconding the motion, said that, while the water was not dangerous, it was unsightly. An important point for the ratepayers to consider was that the Corporation could not make the Company do all that was considered necessary by their Engineers, because the Company's Acts of Parliament were ancient, and they were well protected. He thought the ratepayers would willingly pay more for a better article. For his own part, he was strongly in favour of the acquisition of the undertaking.

Mr. Mead thought the attitude of the Mayor towards the scheme was unfortunate. The resolution should be the real expression of the opinion of the Council, and not the mere formal handing on of the scheme to the ratepayers for their decision.

The Mayor said he was quite willing to pay a better price for a better article; but he was not prepared to bias his fellow ratepayers.

The resolution was carried by 11 votes to 2; and a meeting of the ratepayers is to be held to decide whether the scheme shall be proceeded with.

NEW YORK WATER SUPPLY.

In the "Journal" last week (p. 918), we dealt further with an important report by Mr. John R. Freeman on the above subject, of which a full abstract has appeared in the "Engineering Record." It may be remembered that Mr. Freeman received instructions to "get together as much reliable information on New York's need for more water" as was possible in the time available; and the result of his investigations was to show that the situation of America's greatest city is one that is fraught with the gravest dangers, which only those can appreciate who have had to do without water for a time. He indicated three remedies for this serious condition of affairs—viz., the restriction of waste, the construction of municipal works, and the purchase of water from a private company. These are dealt with in detail by our contemporary, whose remarks thereon may be shortly noticed.

The waste problem in New York is considered at great length in the report, as the city is now using less water per head than Boston, Philadelphia, Washington, Buffalo, Albany, Pittsburg, Chicago, Cleveland, Detroit, Denver, and other large cities. Admitting that more than half the present supply is wasted, it is held that the cost of this is so low

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 945.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment	Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.	£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	18½–19¼*	+⅛	5 7 8	60,000	5	Sept. 18	7	Ottoman, Ltd. . . .	5–5½	..	6 7 3
100,000	10	"	7½	Do. 7 p.c.	13–14*	..	5 7 2	500,000	100	June 1	6	People's Gas & Chicago 2nd Mtg. Bonds	102–106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb. .	101–103	..	4 17 1								
220,000	5	May 16	6	Bombay, Ltd. . . .	6–6⅛	..	4 12 4	851,070	10	Oct. 12	7	River Plate Ord. . . .	10⅛–10⅜*	..	6 10 3
40,000	5	"	6	Do. New, £4 paid .	4–4⅛	..	5 6 8	250,000	Stk.	June 28	4	Do. 4 p. c. Deb. .	99–101	..	3 19 8
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245–255	..	4 14 1	250,000	10	Sept. 28	8	San Paulo, Ltd. . . .	11–12	..	6 13 4
270,000	"	"	9	Do. New	177–182	..	4 18 11	185,000	Stk.	Sept. 14	10	Sheffield A.	234–239	..	4 3 8
50,000	"	"	5	Do. 5 p. c. Pref. .	137–142	–3	3 10 5	209,7 0	"	"	10	Do. B.	231–239	..	4 3 8
159,375	"	June 14	4	Do. 4 p. c. Deb. .	116–120	..	3 6 8	447,427	"	"	10	Do. C.	232–237	..	4 4 5
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig. .	220–230	..	4 6 11	5,641,885	Stk.	Aug. 15	5⅓	South Metrop., 4 p.c. Ord.	128–131	..	4 0 10
226,320	"	"	7	Do. A. Ord. Stk. .	150–160	..	4 7 6	1,520,000	"	July 12	3	Do. 3 p. c. Deb. . .	94–97	..	3 1 10
1,009,500	Stk.	Aug. 29	5	Bristol, 5 p. c. max.	117–118	..	4 4 9	380,940	Stk.	May 16	5	Southampton Ord. . .	110–115	..	4 6 11
420,000	20	Sept. 28	10	British	39–41	..	4 17 7	70,825	"	July 12	4	Do. 4 p.c. Deb.	117–122	..	3 5 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p. c. .	24–26	..	4 12 4	120,000	Stk.	Aug. 30	6	Tottenham and Edmonton A. 5 p.c. B. 3½ p.c. 4 p. c. Deb.	112–117	..	5 2 7
79,000	10	"	9	Do. 7 p. c. . . .	19–21	..	4 5 8	250,520	"	"	4½		80–85	..	5 5 11
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8½–8⅝*	–¼	6 17 2	61,550	"	June 14	4		111–115	..	3 9 7
220,000	Stk.	June 14	4	Do. 4 p. c. Deb. .	98–100	..	4 0 0	182,380	10	Jan. 12	5	Tuscan, Ltd.	7–8	..	6 5 0
150,000	20	July 12	8½	Cagliari, Ltd. . . .	23–25	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98–102	..	4 18 0
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	13½–14½	..	5 10 4								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	54–56	..	5 7 2								
550,000	Stk.	Oct 12	12⅔	Commercial Old Stock .	265–275*	+1¼	4 12 8								
286,425	"	"	9½	Do. New do. .	200–210*	..	4 12 10								
288,237	"	June 14	4½	Do. 4½ p. c. Deb. .	133–138	..	3 5 8								
800,000	Stk.	May 31	9	Continental Union, Ltd.	175–180	+2	5 0 0								
200,000	"	"	7	Do. 7 p. c. Pref. .	170–175	..	4 0 0								
51,600	Stk	—	14	Croydon A 10 p. c. . .	—	..	—								
178,400	"	—	11	Do. B 7 p. c. . .	—	..	—								
555,000	Stk.	Aug. 15	5½	Crystal Palace Ord. 5 p.c.	115–120	..	4 7 6								
60,000	"	"	5	Do. 5 p. c. Pref. .	130–135	..	3 14 1								
486,090	10	July 27	11	European, Ltd. . . .	19–20	..	5 10 0								
354,060	10	"	11	Do. £7 10s. paid .	14–15	..	5 10 0								
14,993,075	Stk.	Aug. 15	4 4/9	Gas-light and Coke 4 p. c. Ord. . . 3½ p. c. max. . 4 p. c. Con. Pref. 3 p. c. Con. Deb.	99–101	..	4 7 2								
2,600,000	"	"	3⅔		92–94	..	3 14 6								
3,799,735	"	"	4		114–117	..	3 8 5								
3,993,975	"	June 14	3		93–95	..	3 8 2								
70,000	10	May 31	8	Hongkong & China, Ltd.	13½–14½	..	5 10 4								
3,800,000	Stk.	May 16	10	Imperial Continental .	208–213	..	4 13 11								
473,600	Stk.	Aug. 15	3½	Do. 3½ p. c. Deb. Red.	99–101	..	3 9 4								
75,000	5	June 14	6	Malta & Medn., Ltd. .	4⅞–5¼	..	5 14 3								
560,000	100	Oct. 1	5	Met. of 5 p. c. Deb.	105–108	..	4 12 7								
250,000	100	"	4½	Melbourne 4½ p. c. Deb.	104–106	..	4 4 11								
541,920	20	May 31	3½	Monte Video, Ltd. . .	10⅞–11½	..	6 1 8								
667,946	Stk.	Aug. 30	9½	Newc'tle & Gatesh'd Con.	210–215	..	4 6 1								
299,855	Stk.	June 28	8½	Do. 3½ p. c. Deb. .	104–107	..	3 5 5								
150,000	5	May 16	8	Oriental, Ltd. . . .	7⅞–7¾	..	5 3 8								
135,000	5	"	8	Dc. New, £4 10s. pd.	5¾–6⅛	..	5 15 3								
15,000	5	"	8	Do. do. 1879, £1 pd.	1⅛–1⅜	..	4 11 5								
					*Ex. div.										
												WATER COMPANIES.			
								780,404	Stk.	June 28	11	Chelsea, Ord.	302–307	+2	3 11 8
								150,000	"	"	5	Do. 5 p. c. Pref. .	155–160	..	3 2 6
								160,000	"	"	4½	Do. 4½ p. c. Pref. 75	143–148	..	3 0 10
								175,785	"	Sept. 28	4½	Do. 4½ p. c. Deb. .	143–148	..	3 0 10
								1,720,560	Stk.	Oct. 12	7	East London, Ord. . .	194–199*	+2½	3 10 4
								654,740	"	June 14	4½	Do. 4½ p. c. Deb. .	147–152	..	2 19 3
								797,687	"	"	3	Do. 3 p. c. Deb. .	97–99	+1	3 0 7
								700,000	50	June 14	7½	Grand Junction 10 p. c. max. . 4 p. c. Deb.	107–110	..	3 8 2
								310,000	Stk.	Sept. 28	4		130–135	..	2 19 3
								708,000	Stk.	Aug. 30	14	Kent	303–305	+2½	4 11 10
								160,000	"	"	7	Do. New, 7 p. c. max. .	200–210	..	3 6 8
								1,043,800	100	June 28	10½	Lambeth, 10 p. c. max. .	292–297	..	3 10 8
								406,200	100	"	8	Do. 7½ p. c. max. .	205–210	..	3 16 2
								350,000	Stk.	Sept. 28	4	Do. 4 p. c. Deb. .	127–130	..	3 1 7
								500,000	100	Aug. 15	14	New River, New Shares	408–413	..	3 7 10
								1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb. .	128–133	..	3 0 2
								902,300	Stk.	June 14	7½	South-wark and Vaux-hall Ord. . . . 7½ p. c. max. . 5 p. c. Pref. 4 p. c. A Deb.	195–200	..	3 15 0
								126,500	100	"	7½		185–190	..	3 18 11
								489,200	Stk.	"	5		155–160	..	3 2 6
								1,019,585	"	Oct. 12	4		127–132*	..	3 0 7
								1,155,066	Stk.	June 14	10	West Middlesex . . .	275–280	+1	3 11 5
								200,000	"	"	4½	Do. 4½ p. c. Deb. .	140–145	..	3 2 1
								200,000	"	Sept. 14	3	Do. 3 p. c. Deb. .	97–99	..	3 0 7
													*Ex div.		

(about $1 per head annually for domestic purposes), and the time and expense of checking the waste are so great, that the subject should not be allowed to retard the construction of works for a future supply. It is Mr. Freeman's belief that public opinion in New York will probably not sustain the metering of all domestic supplies. He recommends that an investigation of the leakage from street mains and services should be made, and new regulations be framed so as to encourage the use of meters on all services. Such a plan would result in the gradual reduction of waste, beginning with the stoppage of the serious leaks in the mains, and ending in the metering of domestic services at the request of the individual consumers to save money.

The second method of relief—the construction of municipal works—very naturally divides itself into the special problems of New York and Brooklyn. The most available source is certainly the Ten Mile River, combined with the Upper Housatonic, which furnish water flowing at present through Connecticut. From this source, 750 million gallons a day can be delivered at the city limits under a head of 300 feet at a cost not exceeding $10 per million gallons. This supply would answer the purposes of New York and Brooklyn for years to come; and it is unquestionably the cheapest and best from an engineering point of view. Unfortunately, grave interstate legal questions are involved, which Mr. Freeman believes can be speedily settled. This view of the case is probably too hopeful, for the matter was considered some years ago by the Counsel of the Croton Aqueduct Commission, who found no legal means of securing water from this source. If the suit between the States of Kansas and Colorado is settled by the Supreme Court of the United States speedily in favour of allowing the appropriation by the citizens of one state of the waters entering another, it may be possible to turn to the Ten Mile River for the supply of Greater New York. Otherwise Mr. Freeman will probably find that his recommendation for the construction of works on this plan will be rejected by the legal profession.

Fortunately, however, there are other sources of supply from which ample volumes of water can be obtained at a cost below that now paid by the city for its present supply. Two of these are especially attractive. An ample supply of water can be brought from the Adirondacks by gravity, and delivered, at an elevation of 300 feet, at the city line at a cost of $25 to $50 per million gallons, according as the supply ranges from 800 down to 200 million gallons daily. An ample supply can also be obtained by constructing filters and pumps at Poughkeepsie, and using the Hudson River as the source. This water can be delivered at an elevation of 300 feet for less than $50 per million gallons. The plan will involve the construction of storage reservoirs in the Adirondacks to let down water whenever there is any sign of brackishness in the Hudson at Poughkeepsie, for without such reservoirs a large draught from the river at this place would probably cause the salt water to move up stream and injure the supply during portions of the summer.

So far as Brooklyn is concerned, if the New York Legislature will permit, from 75 to 125 million gallons of excellent water can be obtained from Suffolk County, on Eastern Long Island, at less than $40 per million gallons. If legislative permission to develop this area cannot be got, the supply must be obtained from New York.

There are still other sources which may be utilized. The Wallkill will probably deliver, if properly developed, upwards of 300 million gallons per day by gravity. The basin of this river presents undesirable features, however, and the water is considered rather hard. The Esopus and connecting watersheds can be developed to yield 200 million gallons a day at about $30 per million gallons. These would be attractive plans were it not for the importance of providing works capable of furnishing at least 500 million gallons daily. It should be added that all these figures of cost include interest, depreciation, maintenance, and a sinking fund to pay off all bonds in forty years.

The third method of obtaining the supply is to accept the proposition of the Ramapo Water Company. It provides for 200 million gallons daily from the Esopus at $70 per million gallons for a period of fifty years, at the expiration of which time a new contract must be made, or the city must build works.* In the light of Mr. Freeman's studies, the acceptance of such a proposition would be an act utterly unwarranted by any condition of the problem.

Our contemporary concludes by saying that, unfortunately for New York, the results of this investigation were made public at the beginning of a season of political activity; and it was too much to expect that they would receive the attention they deserved. There was no question whatever, however, that an appropriation should be immediately made for surveys for an additional supply of an ultimate capacity of at least 500 million gallons per day. The direction of this survey should be placed in charge of an Engineering Committee of a few members of sufficient experience to carry it on with despatch, for all the haste consistent with reliability was imperative. The "Engineering Record" does not believe that it is feasible, for legal reasons, to consider the Housatonic watershed, and therefore holds that the work should be devoted to the Adirondack and the filtered Hudson River water systems. An appropriation of $100,000 is the minimum set by Mr. Freeman for such a survey; and it is regarded as none too large when the urgency of the situation is considered. If undertaken now, plans for the initial construction could probably be ready in a year. It must be constantly borne in mind that the design and construction of any adequate works cannot be finished much within the five-year limit allowed by the condition of the present works, even if the surveys are commenced at once.

* The Company's proposals were fully described in the "JOURNAL" for Jan. 2 last (p. 39).—ED. J. G. L.

Duddon Water for Barrow.—Although the Barrow Corporation added a third large reservoir some months ago to increase the water supply, it is still inadequate to the town's requirements; and it is proposed to obtain parliamentary powers to draw water from the higher reaches of the River Duddon, near to where the counties of Lancashire, Westmorland, and Cumberland meet. There is no intention to disfigure the valley in any way, or injure the classic river. The scheme will embrace the heightening of the water in Seathwaite Tarn, by constructing an embankment 20 feet high.

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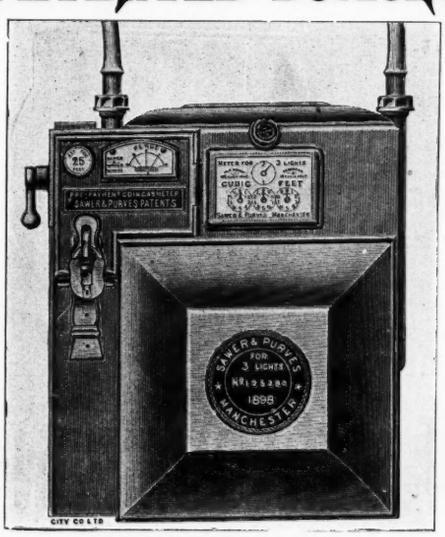
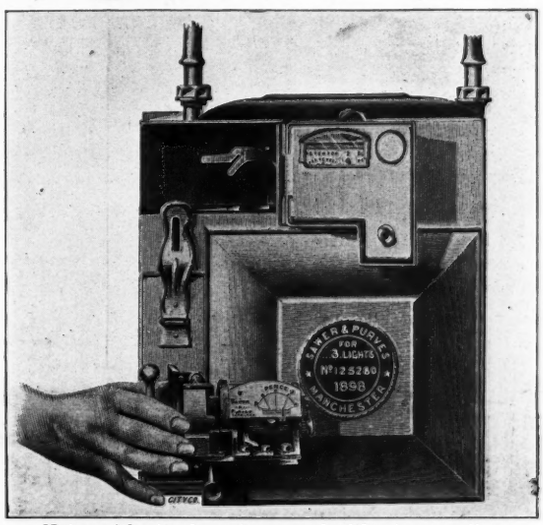


Meter in working position.



Meter with attachment removed without uncoupling.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The appointment of Mr. W. Ewing, of Hamilton, to be the successor of Mr. S. Stewart in the management of the Greenock Gas-Works is an event which I feel I cannot pass by in silence. Since he went to Hamilton, about nine years ago, the output of gas has more than doubled; the gas-works have been almost entirely renewed and extended; the capital of the undertaking has been increased from £22,000 to only £35,000; and the price of gas has been reduced from 2s. 11d. to 2s. 1d. per 1000 cubic feet. This is a good record; and it will be difficult for whoever may be appointed in Mr. Ewing's stead to work up to it. I anticipate it will be difficult for Mr. Ewing to do in Greenock anything like what he has done in Hamilton. He is succeeding a very different sort of person; and, while he will have excellent works to deal with, he will not have the advantage of a low capital, nor the opportunity of doing much to reduce it. He is going to a place where the output is more than twice what it is in Hamilton, and is undoubtedly improving his position. At the same time, he is about to tackle a much harder task.

The Directors of the Oil-Gas Enrichment Company, Limited, in their seventh annual report and accounts, dealing with the year to Sept. 30, state that the balance at the credit of profit and loss is £546, which they recommend be disposed of as follows: To pay the fixed dividend of 5 per cent. on the preference or "A" shares, £250; leaving to be carried forward to next year £296. The Directors regret that the continued rise in the price of gas oil still interferes with the extension of the Company's operations. They have, however, now acquired on behalf of the Company the patent No. 20,125 of 1896, granted in favour of Mr. W. Young, Mr. S. Glover, and Mr. T. Glover, for "improvements in the manufacture of illuminating gas," the acquisition of which will, in their opinion, increase the Company's business. The Directors, with much regret, report the death of Mr. George Harrison, one of their number, whose deep interest in the Company since its formation had been of great value to his colleagues and to the Company generally. They recommend the election of Mr. Samuel Glover, of St. Helens, to fill the vacancy.

The first installation of inclined retorts in Scotland, apart from experimental benches, has been erected in the Aberdeen Gas-Works. There are eighteen retorts in the bench. On Wednesday, the Gas Committee of the Town Council visited the works and inspected the new plant.

There was a criticism of a senseless sort, of the Dundee Corporation Gas Department, uttered by a Mr. High, at the last meeting of the Town Council. He found from the minutes, he said, that they had received £2279 for coke; and he considered that they should have obtained £7500 for it. He calculated that they should have had an annual profit of £48,800. It seems that in Committee Mr. High had asked for information, and that it is being prepared for him. This speech, which he made in open Council, was therefore premature. It resulted in nothing except his unburdening himself of a few reflections of a splenetic nature. Indeed, the only purpose, good or bad, which his introduction of the subject could have served, may be fitly described as "keeping the pot boiling;" the intention being not to let the public forget that a "gas scandal" has been unearthed.

At the annual meeting of the Carnoustie Gaslight Company, held recently, the customary dividend of 7½ per cent. was declared. During the past year, there was an increase of 1,700,000 cubic feet in the manufacture of gas, which was largely due to extra consumption in cookers and gas-engines. Unaccounted-for gas was reduced from 7 to 4 per cent. The price of gas was raised by 5d. per 1000 cubic feet. The Manager (Mr. J. W. Napier) has only been one year at Carnoustie; but he has in that time effected many improvements, including the erection of a retort-bench with regenerative settings. In recognition of his good services, the Directors have advanced Mr. Napier's salary by £30 a year.

The Banff Gaslight Company (which is so thoroughly well managed by Mr. W. Marshall) have had a very successful year. The output increased by nearly a million cubic feet; and the revenue rose from £1919 to £1984. A dividend at the rate of 5 per cent. was declared at the annual meeting. Mr. Marshall is just completing the construction of a gasholder tank upon land adjoining the works, which has been reclaimed from the sea. The structure is of concrete. The whole of the work has been done by the gas-works staff; and when it is completed its cheapness will be a surprise to many.

Some time ago, the embankment of a reservoir at Loch Glow, in Fifeshire, gave way, and the rush of water created great damage. This week it was stated, at a meeting of the County Council, that the opinion of Counsel had been taken as to who was liable for the cost of repairing the damage. The opinion was to the effect that the County Council were liable, but that the Council have a claim for relief against the special water district, in so far as the district is able to bear the burden. The balance remaining to be met amounts to £1631. The County Council have imposed a rate of 2s. 6d. per pound upon the special water district, which will realize about £300. It will thus take five years of this very high assessment to clear off the liability.

Arbroath is unfortunate in its water supply. The Town Council have expended about £8000 in extending the underground workings from which the water is pumped; and now the work is completed, it is found that the supply is no more than 11·362 gallons per head per day. This is altogether inadequate; and something will require to be done to augment it. Already the subject seems to be in the minds of the members of the Corporation. At a meeting this week, it was stated that a long report by Mr. M'Culloch, of Edinburgh and Dundee, had been received. Someone elicited the information that this report did not deal only with the works which are completed, but referred to schemes for the future. On this being ascertained, the question arose as to who had ordered the matter to be reported upon. It was then realized that something had been done which was not altogether regular; and the whole subject was continued to a future meeting.

The Burslem Town Council are making application to the Local Government Board for sanction to borrow £31,000, for a period of thirty years, for the purposes of the gas undertaking.

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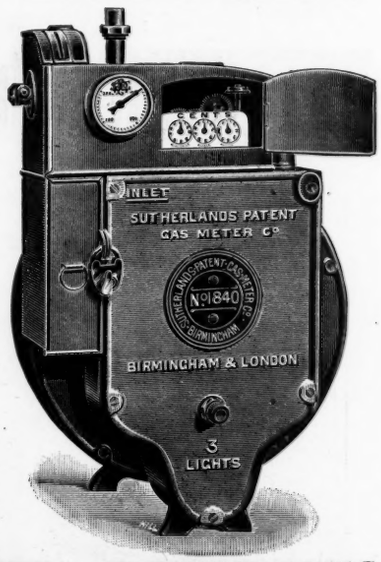

THE SUTHERLAND GAS-METER COMPANY
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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 13.

Sulphate of Ammonia.—In the early part of the week, the market was quiet. Subsequently, however, buyers showed more interest; and the inquiry thus set on foot resulted in a good business being done in the last day or two both for prompt and forward delivery. For this month's delivery, the buying was mainly done at the rates current last week; and the market closes firm at £10 12s. 6d. f.o.b. Leith, £10 11s. 3d. f.o.b. Hull, and £10 13s. 9d. to £10 15s. f.o.b. Liverpool. The chief interest of buyers seems, however, to have centered round forward delivery; and up to £10 15s. has been paid for delivery to end of the year. For the early months of next year, sellers demand a premium on this figure.

Nitrate of Soda is rather firmer at 8s. 1½d. per cwt. for ordinary, and 8s. 6d. for refined quality.

LONDON, *Oct.* 13.

Tar Products.—The continued depression in the value of creosote and tar oils, and the limited business which is being done in pitch—an article which buyers are talking lower—is having an effect upon the prices being offered for tar. Several of the high-priced contracts let earlier on in the season, must, at to-day's prices, entail serious loss on the distillers. Benzols, although perhaps not so firm as a few weeks ago, are looked upon with hope, for large quantities are now being taken off the market for gas enriching; and this for the next month or two will be a constantly increasing quantity. Carbolic acid is easier, and business is reported at 2s. 8d. and 2s. 9d. There is little doing in anthracene, the price of which is nominal.

The week's quotations average out as follows: Tar, 15s. to 22s. Pitch, east coast, 36s.; west coast, 33s. Benzol, 90's, 10d.; 50's, 11½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 1d. Crude naphtha, 4½d. Heavy naphtha, 11d. Creosote, 1½d. to 2d. Heavy oils, 3d. Carbolic acid, 60's, 2s. 9d. Naphthalene, 70s. Salts, 45s. Anthracene, nominal, "A," 4d.; "B," 2½d.

Sulphate of Ammonia is still flat. The Scotch market is inconvenienced by the restrictions on shipment due to the plague. The present price may be taken as £11 10s. to £10 12s. 6d. per ton, less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The position throughout the coal trade of this district presents no appreciable change. All descriptions of round coal still meet with a steady demand, with very little going into stock, and prices well maintained at late rates. In view of the almost entire absence of stocks of any moment, the outlook in the house-fire coal trade is, however, not a very satisfactory one for consumers; and coalowners are regarding with some apprehension the position in which they may be placed during the ensuing winter, should an exceptionally severe season bring forward any great pressure for supplies. For the moment, there is no talk of any further advance in prices; but a great deal will depend upon the character of the winter. It would not be at all surprising if there should be some further stiffening up in quoted rates for house-fire qualities, the list prices for which remain exceedingly firm at about 16s. 6d. to 17s. 6d. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, and 14s. to 14s. 6d. for common house coal. Common round coals meet with a moderately good demand for inland requirements and for shipment. Although not quite so pressing as it has been, the inquiry is still fairly active; and in most cases all that collieries are raising is moving away freely, at full prices—averaging 12s. 6d. to 13s. per ton at the pit for inland sales, with 16s. 6d. to 17s. obtained for steam coals delivered at the ports on the Mersey. The only difficulty collieries have is still with regard to engine classes of fuel, supplies of which continue plentiful on the market—not so much from Lancashire coalowners as from outside districts—and very much will depend upon the probable improvement in the cotton trade as to whether local prices can be maintained against competition from other quarters. So far, Lancashire collieries have not officially reduced their list rates, which, for best qualities, remain steady at about 10s. 6d. to 11s. per ton at the pit, with inferior sorts of slack to be bought at about 9s. 6d. The prices at which slack is obtainable from outside districts show some easing down, and are much below local quotations. The position in the coke trade remains fairly strong as regards the better qualities suitable for foundry purposes, which are still in good demand and firm at recent quotations, ranging from 18s. to 31s. per ton at the ovens, according to quality. The commoner cokes, for furnace purposes, however continue weak, at from about 15s. to 20s. at the ovens.

Northern Coal Trade.—The northern coal trade is decidedly weaker. The end of the Baltic season necessarily throws a considerable quantity on to the market; and the steam coal trade, which first feels this, acts upon other kinds of fuel. Hence best Northumbrian steam coals have been sold at 17s. 6d. per ton f.o.b.—a price that is about 1s. lower than that of a week ago. Steam smalls are also rather weaker at 10s. 6d. per ton. In the gas coal trade, the demand has increased, and should continue to do so for two months. Deliveries are heavy on the large contracts; and there is comparatively little coal for occasional sales. The price under contracts is about 16s. per ton f.o.b.; and for occasional quantities, from 17s. 6d. to 18s. In regard to coke, export qualities are easy at from 29s. to 31s. per ton f.o.b. Blast furnace coke is from 27s. to 27s. 6d. per ton, at the Teesside furnaces. Gas coke is in larger production, but is still comparatively scarce; and the quoted f.o.b. price is from 24s. to 25s. per ton.

Scotch Coal Trade.—The export trade continues to shrink. If the movement goes on, it will soon affect prices. These can scarcely be said to be touched yet; but there is already a difficulty in disposing of inferior sorts of dross. The general expectation is that prices will now begin to decline. The quotations are: Main, 15s. to 15s. 3d. per ton f.o.b. Glasgow, ell 16s. to 17s., and splint 16s. 6d. to 17s. The shipments for the week were 216,058 tons—a decrease of 28,274 tons upon the preceding week, but an increase of 71,172 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,4€3,291 tons—an increase of 1,682,559 tons upon the same period of last year.

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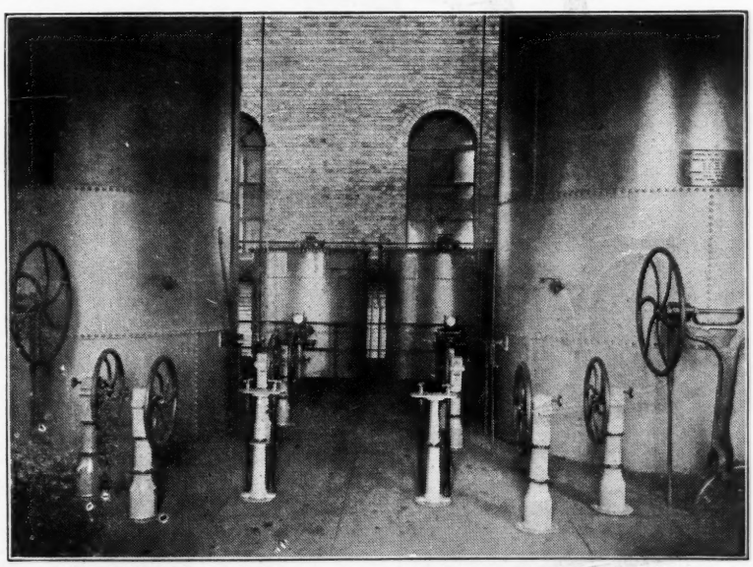

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Dorking Water-Works Purchase Question.—At a recent meeting of the Dorking District Council, a resolution was passed in reference to the promotion of a Bill for the acquisition of the water-works; but it was afterwards held by the Clerk to be invalid, inasmuch as a majority of the whole body did not vote for it. At the meeting of the Authority on Thursday, the matter was reopened; and a resolution was passed to the effect that, in the opinion of the Council, it was desirable to apply for power to take over the Water Company's undertaking at the earliest possible moment, and instructing the Clerk to take such steps as might be necessary for promoting a Bill in the next session of Parliament, either in conjunction with the Rural District Council, or on behalf of the Urban Council alone, for the purpose of acquiring the undertaking, pursuant to powers conferred upon the two Councils by section 6 of the Water Company's Act of the past session, particulars of which have appeared in our columns.

A New Filter-Bed at the Chester Water-Works.—Last Tuesday, on the invitation of the Directors of the Chester Water Company, the members of the Health Committee of the Corporation visited the water-works, to view, before the water was turned on, a reconstructed filter of large capacity, which has just been completed. This filter, together with one adjoining it, has been re-formed on the most approved plans. The water from the reservoir, into which it flows on being pumped from the river, passes on to the surface of the bed in the first instance, and thence by slow percolation through graded sand to the pipes below, thence to the pure-water tank; but when it becomes necessary to cleanse the surface of the bed, pure water from the tank is brought under the bed, and is forced—or, rather, rises by natural gravitation—through the sand to the surface, carrying off into adjoining drains all accumulated impurities which may have been deposited. The present average rate of filtration is 24½ gallons per square foot of surface per 24 hours, as contrasted with 44 gallons to the same area and time in past years, and the recognized standard of 144 gallons of the Local Government Board.

Protecting the Water Supply of Hull.—At the meeting of the Hull City Council yesterday week, the minutes presented by the Water and Gas Committee stated that the Chairman (Alderman Massey) had been negotiating with the owners of land at Cottingham, with a view to the purchase of such land, on the fringe of the wells at Cottingham, as would protect the water supply of the city from contamination by the surface drainage from land covered with nightsoil. The quantity of land required to prevent the risk of contamination of the water supply would be a little over 55 acres; and the price now asked was £10,215. The Committee resolved thereupon that the area of land as shown on a plan submitted should be acquired by the Corporation, in order to prevent the risk of contamination. Alderman Massey moved the confirmation of the minutes, but altered the resolution so as to make the purchase of the land permissive, and not compulsory; thus providing for future contingencies. A little objection was raised as to the price proposed to be paid; and an amendment was moved that the matter be referred back for further consideration. But this was rejected by 44 votes to 14; and the original motion was carried.

Honiton Water Supply.—After a long delay and much fruitless agitation, there is a prospect of something being done for the improvement of the water supply of Honiton. Messrs. Besley, Son, and Nicholls have been awarded the first premium in a competition for schemes for effecting what the Council require. On the recommendation of the Water Committee, the Council decided last week to invite a representative of the firm named to visit the town and advise the Committee as to the details of the scheme. An amendment in favour of deferring action until after the municipal elections which are due to take place on the 1st prox. was defeated.

Proposed Improvement of the Tiverton Water Supply.—A scheme for the improvement of the water supply, at an estimated cost of £5800, has been before the Tiverton Town Council. Of the proposed outlay, £3250 is to be spent on substituting piping for the open leat in which the water is collected and conveyed to the town; while the balance is to provide for two covered service reservoirs. The Streets Committee, who had discussed the scheme, recommended that it should be carried out, and application made to the Local Government Board for a loan for the purpose. After some discussion, however, it was decided that the Council should visit the site of the works, and that the matter should be further considered at another meeting.

The Maintenance of Strikers Out of the Rates.—At the meeting of the Merthyr Tydfil Board of Guardians on the 6th inst., a letter was read from the Local Government Board disposing of the appeal by the Chairman and 39 other Guardians against the Auditor's surcharge of £6709, the amount expended in stoneyard relief to able-bodied workmen during the coal strike of 1898. The Board confirmed the surcharge, but said they were prepared in the exercise of the equitable jurisdiction conferred upon them, to remove the liability; and a certificate was enclosed accordingly. At the same time, they thought it right to add that, as the circumstances did not appear to them to necessitate the consideration of the particular reasons which raised the question of objection to the form of relief—viz., the allowance in money—their decision should not be regarded as involving the acceptance of, or an expression of opinion upon, the reasons referred to them.

Preliminary Engineering Expenses.—The "Local Government Journal" remarks that "the Local Government Board have a peculiar doctrine with regard to the preliminary engineering and legal expenses incurred by Rural District Councils in relation to schemes of sewerage and water supply. If these schemes lead to the execution of works, the cost falls upon the particular parish benefited, in pursuance of section 229 of the Public Health Act, 1875, which declares that the expenses of the construction, maintenance, and cleansing of sewers in any contributory place, and the providing of a supply of water thereto, so far as the latter expenses are not defrayed out of water-rates, shall be special expenses. It often happens, however, that, owing to unforeseen difficulties, or an alteration of circumstances, schemes which have cost much money to prepare are not carried out; and in these cases the Whitehall Board hold that the above provision in the Act of 1875 does not apply, and that the expenses fall upon the common fund of the whole rural district."

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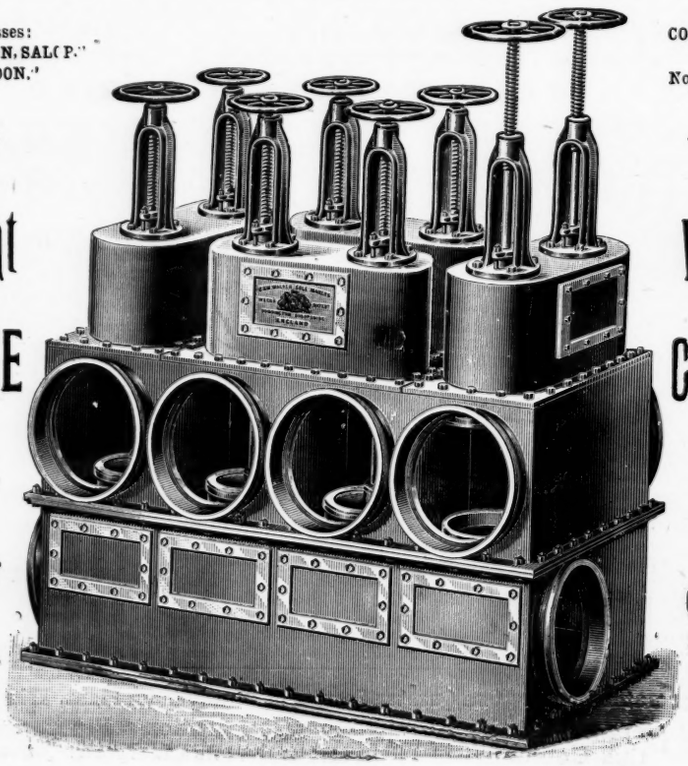

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Darlington Gas-Works Profits.—At a recent meeting of the Darlington Town Council, the accounts of the Gas Department for the half year to the end of June were presented. They showed a profit of £3868, of which £1943 had been placed to the credit of the district fund. It was remarked that, though much more had had to be paid for coal, there was a great increase in the profit compared with the corresponding period of last year.

A Possible "Competitor" for the World's Coal Supply.—The recent increase in the cost of coal all over the world has led to the development of the coal mines in Spain, although insufficient means of transport threaten to paralyze the trade in those provinces where extensive beds of coal exist. Spain consumed last year 4,609,520 metric tons of coal and coke, of which only about 40 per cent. was imported, chiefly from England. The proportion of native fuel has increased every year since 1896. Most mines in Spain are worked with Spanish capital.

Gas Traction at Blackpool.—Reference has on several occasions been made in the "JOURNAL" to the above subject. When the gas-motor tramway was opened in 1896, the line only ran from Blackpool to St. Anne's-on-the-Sea. In October of the following year, however, it was completed to Lytham—the entire distance being about seven miles. The journey has hitherto occupied 60 minutes; but, under parliamentary powers recently granted, the limit of speed has been increased from eight to twelve miles an hour. The new arrangement was inaugurated last Wednesday, when the journey was performed in 35 minutes.

A Change in the System of Gas-Meter Inspection in Manchester.—At the fortnightly meeting of the Gas Committee of the Manchester Corporation last Friday, it was resolved to adopt a new system for informing consumers of the quantity of gas passing through their meters. At present the total amount used during the quarter is put upon the gas bill at the end of that period. For the future, the inspectors, who examine the meters twice quarterly, will on each occasion record the quantity which has passed through since the previous visit upon a card to be left in the meter-box. The consumer will thus have an idea of how his indebtedness is progressing, without having to wait until after the close of each quarter.

Proposed Purchase of the Poulton-le-Fylde Gas-Works by the Local Authority.—The Poulton-le-Fylde Urban District Council having decided to purchase the undertaking of the Gas Company, a meeting of ratepayers was held last week to pass the usual resolution. Mr. J. R. Gaulter, in moving that the Council be authorized to carry out the purchase, under the powers conferred upon them by section 32 of the Poulton Gas Order, 1888, gave some particulars concerning the works to be acquired. He pointed out first that the Order referred to expired in July, 1902; and that if they did not buy the undertaking by then, their right to do so would be gone for ever. The Company, he added, were bound to sell at a price to be mutually agreed upon, and failing agreement by arbitration. The net revenue for the last three years was £539, which, capitalized on the same basis as that adopted for the Swadlincote Company, would give £12,127 as the purchase price. As to how the money would be found, he had worked it out on the assumption that fifty years would be allowed for repayment; and at 3½ per cent. they would have to pay in principal and interest £511 per annum. The income of the Company for the year ending the 30th of June last was £632, which would increase in the future. But taking this figure as a basis, they would have a balance of £120 a year, which could be used in the way of reducing the rates. Mr. J. Swarbrick seconded the motion; and it was carried unanimously.

The Halifax Corporation and the Gas Supply of Adjacent Townships.—At the last meeting of the Sowerby Bridge District Council, it was reported that the Gas Engineer (Mr. J. Marsland) had furnished the Halifax Corporation with the various particulars as to the mains, &c., in Skircoat and Warley which they proposed to take over. The amount to be paid by the Corporation is £5000 for Skircoat, and £4181 for Warley; these sums being calculated on the basis arranged by the two bodies. A letter having been read from the Gas Engineer to the Corporation (Mr. T. Holgate) confirming the terms, it was decided to forward an account for the £9181.

Bolton Gas Supply.—The Gas Committee of the Bolton Town Council met last Friday, and included in the business set down was that of receiving the usual quarterly financial statement from the Office Superintendent (Mr. W. Walch). It showed a gratifying and remarkable increase in the takings. In the three months ending the 30th ult., the receipts amounted to £27,439, against £24,037 in the corresponding quarter of 1899, when the price of gas was 3d. per 1000 cubic feet higher. The cash received by the Department from the 1st of April to the 30th of September aggregated £79,474, which is £4479 more than the sum taken in the corresponding period last year. With the commencement of the present quarter, the price of gas is increased by 2d. per 1000 cubic feet; and the Committee hope by this means to be able to hand over for the relief of the rates, at the end of the present financial year, at least £20,000, despite the fact that coal will cost about £25,000 more than last year.

Wages at the Walsall Gas-Works.—At the meeting of the Walsall Town Council yesterday week, the Gas Committee reported that the men employed at the gas-works, having reopened negotiations with respect to their application for an increase of wages, had sought a further interview with the Committee; and, a deputation having attended and submitted modified proposals, an arrangement had been come to by which an increase of wages would be given as from the 1st inst. to the various classes of workmen, amounting in the aggregate £903 13s. per annum, or about one-half the amount represented by the application received from the men in the first instance. In granting this increase, the Committee had been influenced by the fact that, while all the workmen employed by the Corporation in the various departments had within recent years received additions to their wages, the men employed at the gas-works had not received any increase for the last twelve years. With the advance now given, the wages of the men would compare favourably with those paid to any similar class of men employed in any gas-works in the district. While the total annual sum to be paid would make a considerable drain upon the resources of the undertaking, the Committee ventured to hope that it would not be all loss, but that the men would, by increased and diligent interest in their work, show their appreciation of the spirit in which the Committee had met them.

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Tynemouth Water Supply.—The conveyance of the North Shields Water Company's undertaking to the Tynemouth Corporation has now been completed, and the entire concern is in the possession of the municipal authorities. The sum of £75,000 has been paid for the works, with 5 per cent. interest from the date of arbitration until the conveyance was signed—the Duke of Northumberland receiving £11,000 of the amount, with his proportion of the 5 per cent. interest. There are certain expenses against the £75,000, and several sums to be added to it, which bring the total payable to the Company down to about £64,000. The payment to the Company was made the week before last; and the Corporation's liability to the Duke will be met as soon as his Grace's signature to the conveyance has been formally obtained. Against the 5 per cent. interest which the Corporation agreed to pay, is to be placed the full revenue from the undertaking during the period covered; and as the revenue has largely increased in the interval, the 5 per cent. will be very much more than covered.

Fatal Oil Gas Explosion.—At Bristol yesterday week, an inquiry was held by the City Coroner (Mr. H. G. Doggett) into the circumstances attending the death of John Henry Masters, aged 26, who was injured by an explosion at the Midland Railway oil-gas works, at which he was employed. The accident happened on Monday, the 1st inst.; and details were furnished to the Coroner by Mr. W. Meed, the foreman. On Sunday afternoon, witness inspected the works, when everything was apparently in order. He was called to the place at 4.30 a.m. on Monday, when he found the engine-house and other buildings on fire, with the gas blazing out of one of the high-pressure pipes. Witness immediately procured the key, and cut off the gas. Deceased had meanwhile been removed to the coal-stage, and a doctor was fetched prior to his conveyance to the Infirmary. Witness, on a subsequent examination, found a burst in one of the pipes, about 4 feet from the engine. This piece he cut out and now produced. In April, 1891, he had seen the pipe subjected to a pressure of 200 lbs. to the square inch. The ordinary working pressure was 150 lbs. There were no lights in the engine-house; but in the boiler-house, which was divided from it by a door, there were gas-jets. It was witness's opinion that, when the deceased noticed the escape, he opened the door to find out where it was; and an explosion occurred, caused by the accumulated gas becoming ignited at the light or the boiler fires. It would have been possible to turn off the gas without entering the engine-house, if the deceased had had the presence of mind to do so. J. A. Dezzant, a locomotive driver, deposed that he heard the explosion, and, on looking round, saw that the roof of the gas-house was blown off and the premises on fire. They saw the deceased run out from the engine-house all in flames, and found him in the carriage shed quite conscious. Mr. F. H. Stalvies, locomotive superintendent at Bristol, and supervisor of the oil-gas works, furnished technical evidence, in the course of which he stated that the burst was due to a defect in the pipe. Mr. H. F. Mole, the House Surgeon at the Infirmary, stated that deceased was severely burnt. Death was due to congestion of the lungs, following on the burns. The Jury returned a verdict to this effect, adding that the explosion was due to a faulty pipe, and suggested that another hand be employed day and night at the works.

The Loans for the Loughborough Gas and Water Works Purchases.—At a special meeting of the Loughborough Town Council yesterday week, formal resolutions were passed by which it was agreed to raise a sum not exceeding £152,994. Included in the amounts was £40,000 in respect of the water-works, £87,098 for the purchase of the Loughborough Gas Company, £2000 for compensation to the Gas Company's officers, and £8750 for the redemption or payment of all mortgages to the Gas Company. The stock (to be issued at £95) must be redeemed at par in 1960, or it may be redeemed at par at the option of the Corporation in 1920.

Colonial Gas Association, Limited.—Reporting upon the working of this concern during the year ending June 30 last, the Directors are enabled to state that the revenue again shows an increased profit over the preceding year. There has been an advance in the consumption of gas; and the indications of returning prosperity in the Colonies continue to be encouraging. The accounts disclose a profit of £4171, from which £1171 was paid to the shareholders as an interim dividend. After providing for interest on debentures, &c., to June 30, there remains a balance, including the amount brought forward, of £2216. The Directors now recommend a dividend, for the second half of the year, at the rate of 4½ per cent. per annum, free of income-tax (making 3¾ per cent. for the year). This will absorb £1745, and leave £471 to be carried forward.

Gas Loan for Barnoldswick.—Mr. M. K. North, Assoc.M.Inst.C.E., recently held at Barnoldswick an inquiry respecting an application made by the District Council to the Local Government Board for sanction to the raising of £6000 for gas-works purposes. The Clerk (Mr. C. Thornton) stated that in August, 1892, the Council purchased the gas-works at a cost of £13,850, and in the following year obtained an Act of Parliament, under which the application was being made. The population of Barnoldswick at the last census was 4131; the assessable value of the town, £16,338; and the rateable value, £14,472. At the time of the purchase, the Gas Company made, on an average, 7 million cubic feet of gas per annum; and during the six years the undertaking had been in the hands of the Council the average was 20 millions. The number of consumers on the books at the time of the transfer was 364, but it had been increased to 852; and they had 1660 meters and 240 gas-stoves in use. When the Council took possession, the annual receipts amounted to £1200; for the year ending March 31 last, the income from the gas-works alone amounted to £3568. The estimated population now was 7000, and the cause of the increase in the production of gas had been the extensive building operations which had been carried on; Barnoldswick having grown very much since the formation of the Council. The sum of £1679 was required for mains and valves, £400 for service-pipes, £1000 for cookers, £1000 for meters, £1000 for a generator setting, £280 for a retaining-wall, £280 for a reservoir, and £40 for sundries. The Engineer (Mr. D. E. Garlick) said that there were now some 7½ miles of mains; and the present application was for means to lay another 3 miles. The pipes were chiefly required for new streets and for cookers; 762 additional meters had been put in, and 214 stoves. At the close of the inquiry, the Inspector visited the works, and expressed his satisfaction therewith.

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Portland Gas-Works Transfer.—On the 1st inst., the Portland gas undertaking was handed over to the Portland District Council. It will be remembered that Mr. W. A. M'Intosh Valon was accepted by both parties to fix the sum to be paid by the District Council to the Company, which he placed at £28,656. All parties agreeing, the District Council were, by the consent of Lord Morley, able to promote a late Bill giving them power to purchase. Mr. Valon, being named in the Bill as the Valuer between the Company and the District Council, attended at Portland on Sept. 29 to value the stocks and make the necessary arrangements for the transfer on the following Monday. The matter, therefore, is now completed.

Sheffield Gas Company and their Workmen.—Referring to the paragraph which we quoted last week from the "Sheffield Independent," Mr. Hanbury Thomas, the General Manager of the Sheffield Gas Company, has written to our contemporary as follows: "I was surprised to see it stated that the wages paid by the Sheffield United Gas Company are 'below the pay of workmen in Leeds, Manchester, Birmingham, and towns of a similar size,' as such is not the case. As a matter of fact, the Company pay to their stokers the highest wages of any gas undertaking out of London, as the following rates, taken from the report on 'Standard Time Rates of Wages,' just published by the Labour Department of the Board of Trade, will show: London, 6s., 5s. 10d., and 5s. 9d. per shift of eight hours. Leeds, 5s. 2d. per shift of eight hours. Manchester, 5s. 3d. per shift of eight hours. Birmingham (hand stokers), 5s. 3d. per shift of eight hours. Birmingham (stokers employed on machinery), 5s. 9d. per shift of eight hours. Sheffield (both hand and machine stokers), 5s. 9d. per shift of eight hours. And the list further shows that no other towns pay more than 5s. 6d. per shift. I may add that the wages of the stokers were advanced in November last from 5s. 6d. to 5s. 9d. per shift, and that the rates of pay of all other classes of the Company's workmen have been similarly increased during the past twelve months."

The Transfer of the North Bierley Gas Company's District to the Bradford Corporation.—Among the minutes of the Finance and General Purposes Committee which were adopted at last Tuesday's meeting of the Bradford City Council, were two or three interesting ones referring to the gas supply of the North Bierley Company's area. In the first place, respecting the transfer of this district to the Corporation, it was reported that a Sub-Committee appointed to negotiate with the North Bierley Company had considered communications from the Solicitors of the Company with regard to the proposed payment of shareholders in Corporation mortgages instead of cash, and had given instructions for arrangements to be made as far as possible for shareholders to take three, five, or seven year mortgages at 3¼ per cent. interest. The North Bierley Company had also been requested to raise by 3d. per 1000 cubic feet the price of gas supplied by them in the districts of Shelf and Cleckheaton, so as to accord with the provisions of the Local Act of last year. The Gas Engineer was instructed to report as to the Corporation supplying gas to the Toftshaw and Lower Wyke districts, where the inhabitants at present purchase gas from the Drighlington and Brighouse Companies respectively, though these districts are within the North Bierley gas area, purchased by the Corporation.

Threatened "Boycott" of Penny-in-the-Slot Meters.—According to the "Daily Chronicle," a Protection League has been formed among the gas consumers of St. Luke's Peabody Buildings, who, in the event of the Gaslight and Coke Company refusing to concede to them a reduction in the price of gas, pledge themselves to "strike" against the Company by not using the penny-in-the-slot meter in their rooms. Residents in the Clerkenwell, Drury Lane, and Islington Peabody Buildings are invited to join.

The Gas and Water Works Purchase Question at Aldershot.—Last Tuesday evening, a meeting of the Aldershot Ratepayers' and Tradesmen's Association was held to ascertain the views of the members on the above subject. The Rev. J. W. Pickance presided; and he was supported by a goodly number of members of the District Council, including the Chairman (Mr. J. May). The result of considerable discussion was the adoption of a resolution to support the application made to the Chairman of the Council to call a public meeting, as mentioned in the "JOURNAL" last week.

Proposed Purchase of the Wells Water-Works.—A special meeting of the Wells Town Council was held yesterday week for the purpose of taking the necessary formal steps for promoting a Bill in the next session of Parliament for power to acquire the works of the Wells Water Company. The Mayor explained that so far matters were progressing very satisfactorily; and he moved that, in the judgment of the Council, it was expedient to acquire parliamentary powers to enable them to purchase the water-works, and to carry out other matters connected therewith. This was seconded by Mr. J. C. Davis, and unanimously agreed to.

The Bristol Gas Company's New Holder at Horfield.—At the meeting of the Bristol Town Council last Tuesday, the Sanitary Committee reported that the Bristol Gas Company have erected a gasholder in the urban district of Horfield, and the Company consider it necessary to provide means for draining the surplus water from the tank. By section 6 of the Bristol Gas Act, 1899, the Company are prohibited from passing the water into the Boiling Wells Stream; and the Urban District Council of Horfield have no sewer capable of draining the property. In these circumstances, the Company have applied to the Committee for the terms upon which they might be allowed to drain the premises by means of the Corporation sewer. The Committee are willing to receive the drainage of the property, but are of opinion that the Horfield Urban District Council, who will receive the general district rates accruing upon the premises, should pay a proportion of the rates to the Corporation as consideration for draining them by means of the city sewer. The Committee therefore recommended that they be authorized to enter into an agreement conferring on the Company the right to drain the property in the manner proposed, in consideration of a payment by the Horfield Council to the Corporation of an annual sum at the rate of 3d. in the pound on the rateable value of the gasholder, from time to time—"the agreement to be determinable by twelve months' notice at any time, and to contain such other provisions as the Town Clerk may consider necessary for the protection of the interests of the Corporation." This proposal was assented to.

RICHMOND & CO.,
LIMITED.

DUBLIN BRANCH.
FIRST ANNUAL
EXCURSION.

OFFICE & SHOW-ROOM
STAFF:
GRAFTON STREET, AND
HAWKINS STREET.

ALSO:
GAS-FITTERS,
MAINTENANCE
DEPARTMENT
(*i.e.* CLEANING AND
REPAIRING),
CANVASSERS, &
INTERVIEWERS.

The Municipal Commissioner at Bombay is advocating the introduction of water-meters, for preventing the waste of water and enabling the residents to be provided with a constant supply.

We have received from the Technical Publishing Company, Limited, Manchester, "The Chemistry of the Materials of Engineering," by A. Humboldt Sexton, Professor of Metallurgy in the Glasgow and West of Scotland Technical College.

In a report which stands upon the *agenda* for the meeting of the London County Council to-day, the Public Control Committee furnish a short summary of the Metropolis Gas (Prepayment Meter) Act and the South Metropolitan Gas Act of last session.

A motion was before the Southend Town Council last Wednesday, instructing the Law and Parliamentary Committee to promote a Bill in the ensuing session of Parliament for the acquisition of the gas-works; but after a very brief consideration, it was rejected.

On Thursday, a Local Government Board inquiry was held at Whaley Bridge with reference to an application by the Chapel-en-le-Frith Rural District Council for sanction to borrow £2158 and £6172 for the water supply of Chapel-en-le-Frith and Fernilee respectively.

The Water Committee of the St. Helens Corporation have decided that all plumbers authorized under the Corporation should be registered under the provisions in this respect of the Worshipful Company of Plumbers, with a view to ensuring the appointment of none but competent workmen.

An eight-hour day has been conceded to the stokers employed by the Hartlepool Gas and Water Company.

The New Sunlight Incandescent Company (1900), Limited, has been registered with a capital of £100, in £1 shares, to acquire the goodwill, business, trade marks, and designs of the New Sunlight Incandescent Company, Limited (incorporated in 1899). The Directors are those for the time being of the Welsbach Company.

As the result of the scraping of the water-pipes, the average daily delivery into the Workington reservoir of the Cockermouth and Workington Joint Water Committee is above 620,000 gallons, or an increase of 134,000 gallons. The cost of the scraping was £470 14s. 7d. It is understood that it is to be carried through to Workington.

The exports of coal from the United Kingdom amounted last month to 4,115,197 tons, as compared with 3,763,206 tons in September, 1899, and 3,506,218 tons in September, 1898. In one way or another, coal left this country in the first 39 weeks of the year to the aggregate extent of 43,086,752 tons, as compared with 41,642,044 tons and 34,516,416 tons in the corresponding periods of 1899 and 1898.

A French authority has computed that the annu al production of calcium carbide has already reached 256,000 tons. Taking £15 per ton as the average price of the carbide, the to'al value of the product is more than £3,800,000 per annum. The cost of manufacture is about £8 10s. per ton with water power, and about £12 per ton with steam-engines. It is claimed, however, that at Meran, in Austria, the price has been brought down to £7 10s. per ton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

ENRICH your Gas with cheap Benzol,

Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.
Apply to SADLER AND CO., MIDDLESBROUGH.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

SADLER & CO., Ltd., Middlesbrough,

Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1899, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited,

Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Waggons or Carboys. Highest references and all particulars supplied on application.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.
MELROSE CYCLE COMPANY, COVENTRY.

PORTER & CO., Gowts Bridge Works,

LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, see Oct. 2, p. 864.]

WANTED, a Situation by a young Man (aged 19). Can read and fix Meters, Stoves, and Incandescent Lights, and do General Repairs. Three Years in present Situation.
Address A. NOY, George Street, Walsoken, WISBECH.

ADVERTISER (31) wishes to treat with a Gas Company as MANAGER, or TRAVELLER for Gas-Fittings, Stoves, and Incandescent Goods. Thoroughly understands both. Also slight knowledge of Electric Light.
Address No. 3580, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

APPOINTMENT desired by Traveller, SHIPPING AGENT, and FOREIGN CORRESPONDENT, accustomed to call on Gas and Water-Works Managers; or as SECRETARY or GAS-RENTAL ACCOUNTANT. Ex-Manager of Gas-Works.
Address No. 3577, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FITTER.

WANTED, immediately, by the St. David's Water and Gas Company, Pembrokeshire, a thoroughly practical and capable FITTER, to Tap Mains and Lay Services. Accustomed to work with Wrought-Iron Tubes, and with knowledge of inside Work.
Apply, by letter, stating Qualifications, References, Wages, &c., to the SECRETARY, 4, Tokenhouse Buildings, LONDON, E.C.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH,

Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application.
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

WANTED, immediately, an experienced STOKER used to Shovel Charging, and Engine and Exhauster. Must be steady and reliable.
For Particulars, apply to H. C. SHEPHERD, Manager and Secretary, Gas-Works, Cricklade Road, SWINDON.

WANTED, a sharp Youth for the Gas-Rental Department of a Provincial Gas Company. Must write a good hand, and have a good knowledge of Office Work.
Apply, by letter, to No. 3581, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FITTERS WANTED.

TWELVE additional Fitters required, used to Compo. and Barrel work. Must be quick and neat. Only good Men need apply.
Give References and Wages required to RICHMOND & CO., LIMITED, DUBLIN.

WANTED, an active, reliable Man as GAS STOKER, used to Shovel Charging, and Engine and Exhauster. Wages 34s. per week. Railway Fare paid by arrangement.
State, by letter, Age, Experience, and when Disengaged to No. 3579, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKS Manager required in Engineering Works. Must be steady and capable of turning work out cheaply and expeditiously. One used to Gas Plant preferred.
State, by letter, Age, Experience, and Salary expected, to No. 3574, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ROTHERHAM CORPORATION.
(GAS DEPARTMENT.)

WANTED, a thoroughly capable Works FOREMAN. Experience of Inclined Retorts and raking Furnaces necessary. Wages £2 per week; Eight-Hour Shifts.
Apply, with Testimonials, to the undersigned not later than Oct. 23.

FRANK A. WINSTANLEY,
Engineer and Manager.

WANTED, at a Country Gas-Works, two steady FOREMAN STOKERS, used to Shovel Charging, Generator Furnaces, and to Engine and Exhauster. Wages 36s. 2d. for Seven days. Twelve-hour Shifts, Day and Night alternately.
Apply, by letter, addressed to No. 3578, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., stating the Weight of Coal the applicant will undertake to Carbonize, and the number of feet of Gas to make, including Furnace Work, the Wheeling in of Coal, and the Wheeling out of Coke.

WANTED, for Gas-Works in Brazil, an ASSISTANT MANAGER. Applicants must be well acquainted with the routine of management, and especially of Carbonization.
Preference will be given to Applicants having Experience of Electric and Incandescent Street Lighting and Generator Furnaces.
Salary £90 per month, with Apartments, Fuel, and Gas. Three Years' Engagement. First-class Passage out and home.
Apply, by letter, to No. 3576, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF BIRMINGHAM.

THE Secretaryship of the Gas Department will shortly be VACANT. Salary £1000 per annum.

Preliminary inquiries as to the duties of the Office should be addressed to the Secretary of the Gas Committee, Council House, Birmingham. Experience in the Financial and Commercial Management of a Gas Undertaking or of a large Manufacturing Business is desirable.

Copies of Applications for the appointment may be forwarded to members of the Gas Committee; but Candidates are earnestly requested to abstain from canvassing the members of the Council or of the Gas Committee.

SCUNTHORPE URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS-WORKS MANAGER.

THE Scunthorpe Urban District Council invite Applications for the Office of WORKS MANAGER of their new Gas-Works.

Applicants must thoroughly understand the Management of Gas-Works, and be able to read and fix Meters, and do any ordinary Fitters' Repairs on the Works, Mains, and Service-Pipes. The person appointed will be required to reside on the Works, and will have House, Gas, Coal, and Rates free.

The output will probably be about 9 million cubic feet to commence with; and it is expected to rapidly increase under proper management.

Applications, in Candidates' own Handwriting, stating Age, Experience, and Wages required, with not exceeding three Testimonials, must be sent to me, at my Office, Trafford Street, Scunthorpe, before Three p.m., on Tuesday, the 16th day of October, 1900, and should be marked on the cover "Gas-Works Manager."

By order of the Council,
FRANK C. HETT,
Clerk.

Scunthorpe, October, 1900.

WANTED, 2200 yards of 4-inch Cast-IRON WATER-PIPES. Must be strong.

Price, delivered at Wigan, to the MOSS HALL COAL COMPANY, LIMITED, near WIGAN.

FOR SALE—200 Street Lamp-Posts, with LANTERNS and FRAMES.

Apply to the GAS COMPANY, ST. ANNE'S-ON-THE-SEA.

"CUTLER'S" Condenser, ¾ million day, equal to new; weight 12 tons; accept £100 on rail, Berkshire, if sold promptly.

J. F. BLAKELEY, Thornhill, DEWSBURY.

TO BE LET on Hire—

FACING MACHINE, for facing *in situ* Self-Sealing Retort Mouthpieces any shape or size, □, Oval, or Circular.

PULSOMETER, Size No. 5, with 4-in. suction and 3-in. delivery. Steam-Pipe ¾ in. diameter. Discharge 10,000 Gallons per hour.

Write J. WRIGHT, Bridge House, BLACKFRIARS BRIDGE, E.C.

PURIFIERS FOR SALE.

THE Directors of the Clayton, Allerton, and Thornton Gas Company are prepared to receive OFFERS for Four 12-feet square old PURIFIERS, with CENTRE-VALVE and 12-inch CONNECTIONS, LIFTING and TRAVELLING APPARATUS, and Two 12-inch RACK and PINION VALVES.

Also Two old PURIFIERS, 22 ft. by 8 ft., with 10-inch CONNECTIONS and Two Anderson 10-inch FOUR-WAY VALVES and Four 10-inch RACK and PINION VALVES and LIFTING APPARATUS.

The whole can be seen at the Company's Works in position, and to be pulled down and removed by the purchaser.

By order,
JOHN NIVEN,
Secretary and Manager.

Clayton, near Bradford,
Sept. 18, 1900.

FOR SALE—Nine old Cast-Iron Gas-HOLDER COLUMNS.

For Particulars, apply to W. J. DOUGALL, Engineer and Manager, Gas-Works, SEVENOAKS.

FOR SALE, Cheap—One, Two, or Three PURIFIERS, 8 ft. square by 4 ft. deep, in good condition, with Valves, Connections, and Lifting Gear.

Apply to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

OFFERS wanted for Second-hand CYLINDRICAL STATION METER to pass 12,000 cubic feet per hour.

Address GENERAL MANAGER, Enfield Gas Company, Enfield, MIDDLESEX.

HIGH-PRICED COAL.

SMALL Gas-Works Authorities should immediately adopt an EXHAUSTER, and thus make probably at least 750 cubic feet of gas more from each ton of Coal carbonized. Several small sets *in stock*, both New and Second-hand.

Address J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

J. FIRTH BLAKELEY & CO., Thornhill, Dewsbury, have FOR SALE:—

One Set of Three 6-ft. PURIFIERS.
One „ Two 8-ft. „
One „ Four 8-ft. „
One „ Four 16-ft. by 12-ft. PURIFIERS.
Four 5-inch ANNULAR CONDENSERS.
Four 10-inch „ „
Six 16-inch „ „
"Cutler" ¾ million WATER CONDENSER.
Wrought-Iron TOWER SCRUBBERS, 3 ft. by 14 ft., 3 ft. 6 in. by 27 ft., and 7 ft. by 32 ft.
Cast-Iron TOWER SCRUBBERS, 3 ft. 6 in., 5 ft., and 6 ft. diameter.
EXHAUSTERS, 2000 to 60,000 Cubic Feet per hour.
"Holmes" & "Clapham" WASHER-SCRUBBERS.
"Livesey" & "Cripps" WASHERS.
4-in., 6-in., 8-in., and 10-in. STATION METERS.
Splendid GASHOLDER, 50 ft. by 20 ft.
RETORT IRONWORK, MODERN HYDRAULICS.
Telegrams: "BLAKELEY, THORNHILL LEES."

THE GASLIGHT AND COKE COMPANY.

SALE BY TENDER
OF
£125,000 ORDINARY STOCK,
AND OF A SUM NOT EXCEEDING
£100,000 THREE PER CENT. CONSOLIDATED DEBENTURE STOCK.

THE Directors of this Company will be prepared to receive, not later than Wednesday, the 24th inst., TENDERS for the above-named STOCKS of the Company, in amounts of £5, or multiples thereof. Such Stocks are to be paid up in full as follows—viz.,

Ordinary Stock, the 15th of November, 1900,
Debenture Stock, the 1st of December, 1900,

and will be registered in the Company's Books free of Expense.

The Minimum Prices below which no Tenders will be accepted are as follows—viz.,

Ordinary Stock, £100 per Cent.,
Debenture Stock, £94 per Cent.

Forms of Tender, with full Particulars and Conditions, may be obtained on application at this Office.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Oct. 2, 1900.

MAIN PIPES FOR SALE.

THE Directors of the Sittingbourne District Gas Company are prepared to receive OFFERS for about 600 yards of 8-inch old CAST-IRON MAIN PIPES.

The whole can be seen at the Company's Works, Sittingbourne.

Offers to be sent in, not later than Nov. 5, to me the undersigned.

J. DONALDSON,
Engineer.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

THE Gas and Electric Lighting Com-mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.

Specifications, Quantities, and Form of Tender can be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, J.P., Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Tuesday, the 30th of October, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E. & M.Inst.E.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Oct. 12, 1900.

IMPERIAL CONTINENTAL GAS ASSOCIATION

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 6th of November next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 30th of June, 1900, and the usual Ordinary Business of such Meeting transacted.

Notice is Hereby also Given, that the CAPITAL STOCK TRANSFER BOOKS WILL BE CLOSED from the 23rd inst. to the 6th prox., both days inclusive.

The Dividend will be paid on the 13th of November.

By order of the Board,
ROBERT W. WILSON,
Secretary.

21, Austin Friars, London, E.C.,
Oct. 15, 1900.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £10,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE, £103 per Cent.

IN PURSUANCE OF THE TOTTENHAM AND EDMONTON GAS ACT, 1898.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £10,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK of the Company, to be paid up in full on or before the 7th day of December next; such Stock being a portion of the Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of Proprietors, held on the 24th day of February, 1900, in pursuance of the Powers under Sections 15 and 17 of the above-mentioned Act.

Particulars, Conditions, and Form of Tender may be had on application at this Office, and sealed Tenders must be sent in not later than Four o'clock in the afternoon of Monday, the 19th day of November next.

By order,
JAMES RANDALL,
Secretary.

Offices: Willoughby Lane,
Tottenham, Oct. 12, 1900.

Now Ready. Price, Cloth Bound, 12s. 6d.; Morocco Gilt, 18s.

GAS COMPANIES'
BOOK-KEEPING.

A PRACTICAL TREATISE ON THE KEEPING OF GAS COMPANIES' ACCOUNTS.

By JOHN HENRY BREARLEY and BENJAMIN TAYLOR, of Longwood.

The only complete Treatise on Gas Companies' Book-Keeping ever published.

This book will be found invaluable to those desirous of obtaining a thorough grasp of Gas Companies' Book-Keeping and Accountancy.

A complete set of Transactions are dealt with; the same being entered into the various Books, and posted into the Ledgers. A Model Balance-Sheet is prepared from the set of transactions and postings.

Forms and subsidiary books are illustrated and described. The linking together of the various books is shown at a glance by means of a Chart.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

BOROUGH OF KENDAL.
(GAS DEPARTMENT.)

GASHOLDER AND STEEL TANK.

THE Gas, Water, and Electricity Committee of the above Corporation are prepared to receive TENDERS for the construction of a STEEL GASHOLDER TANK, 90 feet diameter by 25 feet deep; also of a TELESCOPIC GASHOLDER, Inlet and Outlet Pipes, and Appurtenances, to be erected at the Gas-Works, Kendal.

Copies of the Specification, Bill of Quantities, and Form of Tender may be obtained, and Plans seen, at the Office of Mr. T. N. Ritson, Assoc.M.Inst.C.E., Engineer and Manager, Gas-Works, Kendal, on payment of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

The Committee reserve the right to modify the above-mentioned Specification and Plans, so as to enable Makers of Patent Cable and Spiral-Guided Gasholders and other persons wishing to avail themselves of Patent or other rights or facilities to tender in accordance with the Contractor's own Designs. Such alternative Designs, with complete Plans and Specifications, to be submitted to the Engineer, and approved by him before the Tenders are made.

Sealed Tenders, endorsed "Tank and Holder, Contract No. 2," to be delivered to the undersigned not later than Twelve o'clock noon on Wednesday, Oct. 31, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

(Signed) JOHN BOLTON,
Town Clerk.

Kent Street, Kendal,
September, 1900.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF ORDINARY STOCK.

THE Directors have instructed Mr. ROBERT MACK to SELL BY AUCTION, at the Offices of the Company, Newcastle-upon-Tyne, on Wednesday, the 7th day of November, 1900, at Twelve o'clock at noon,

TWENTY-FIVE THOUSAND POUNDS
ORDINARY STOCK

of the Company, to be issued under the Powers of the Company's Act of 1896.

For Conditions of Sale and further Particulars, apply to the undersigned.

THOMAS WADDOM,
Secretary.

Offices: 35, Grainger Street West,
Newcastle-upon-Tyne.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ALDERSHOT GAS AND WATER COMPANY.

500 £10 "E" SHARES.

250 being Seven per Cent. Ordinary Shares, and 250 Five per Cent. Preference Shares.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 23, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £5000 NEW ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 23, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 250 £10 "C" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 23, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
NEW SWINDON GAS COMPANY.

£3719 NEW ORDINARY FIVE PER CENT. STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 23, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WESTGATE AND BIRCHINGTON GAS COMPANY.

NEW ISSUE OF 300 £10 NEW ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 23, at Two o'clock precisely, in Lots.

Particulars of Messrs. HOUSEMAN AND CO., Solicitors, 8, PRINCES STREET, E.W.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ILFORD GAS COMPANY.

£5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 6, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
EPSOM AND EWELL GAS COMPANY.

NEW ISSUE OF £3000 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK.

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Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of H. W. Ulph, Esq., deceased, and other Owners.

GAS AND WATER STOCKS AND SHARES
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BARNET DISTRICT GAS AND WATER COMPANY,
EAST COWES GAS COMPANY,
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MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 6, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £30,000 NEW ORDINARY STOCK.

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£30,000 of NEW ORDINARY STOCK

in the above Undertaking, ranking for a Standard Dividend of 3½ per cent., subject to the Sliding-Scale, and entitled under the present price charged for Gas to a Dividend of £5 1s. 6d. per cent.

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Now Ready, Price 15s., Limp Cloth,

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AND OF THE

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OF

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FOR THE YEAR 1899-1900.

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INCREASE YOUR ILLUMINATING POWER
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The Cheapest and Best in the Market.

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With Elevators and Conveyors worked by Steam or Gas Engine.

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BLACK BED GAS COAL.

Prices and Analysis on application.

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Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

As per Analysis by
Mr. JOHN PATTINSON, F.I.C., F.C.S.

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FOR GAS-FURNACES.

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By arrangement with the Proprietors of the above Patent, we are now prepared to receive enquiries and consult with Managers of Gas-Works where trouble is experienced with **NAPHTHALENE DEPOSITS,** and to instal the necessary Apparatus.

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Analysis made by

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Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the

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Head Office: Miles Platting, MANCHESTER.

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GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16$\frac{7}{10}$ Stand. Sperm Candl.
Coke (of good & pure quality)	13$\frac{3}{4}$ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

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For use in the

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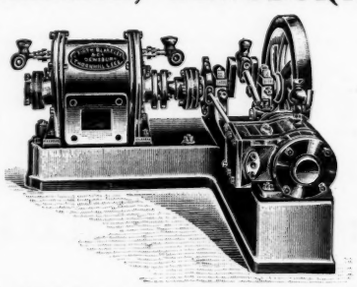

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Illuminating Power	17·8 candles.
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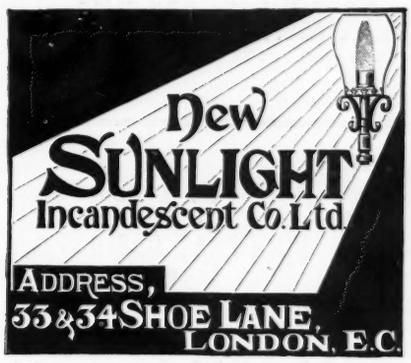

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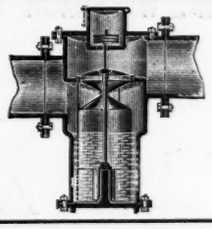

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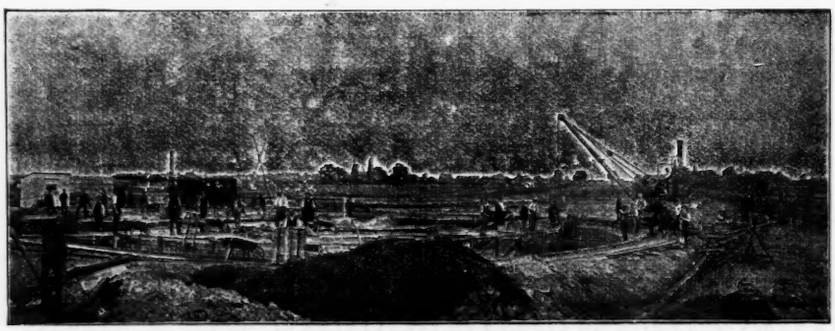

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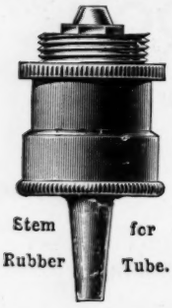

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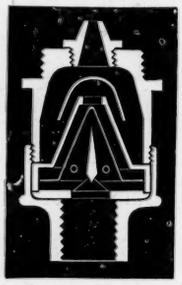

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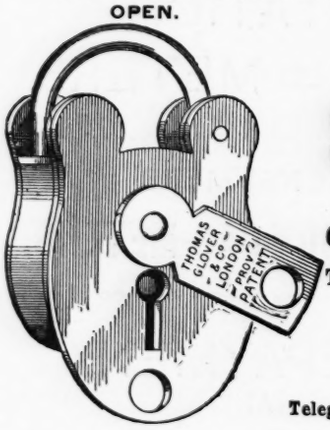

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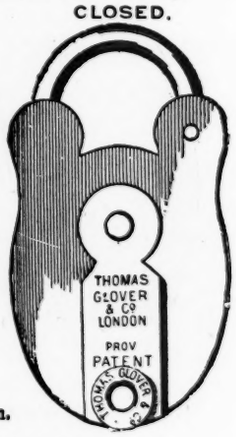

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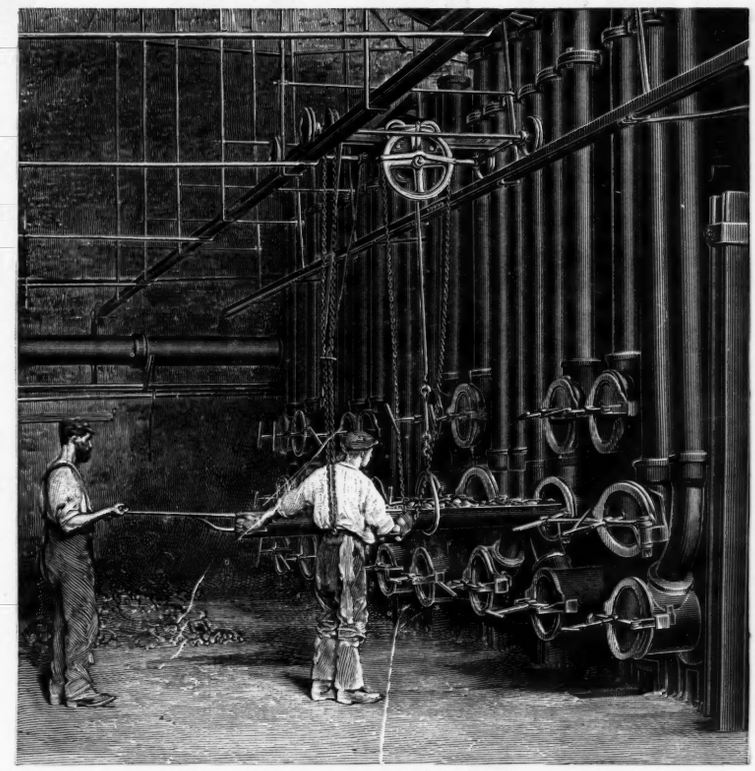

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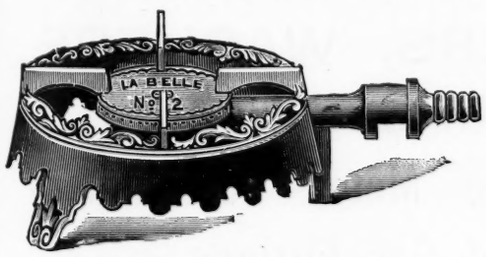

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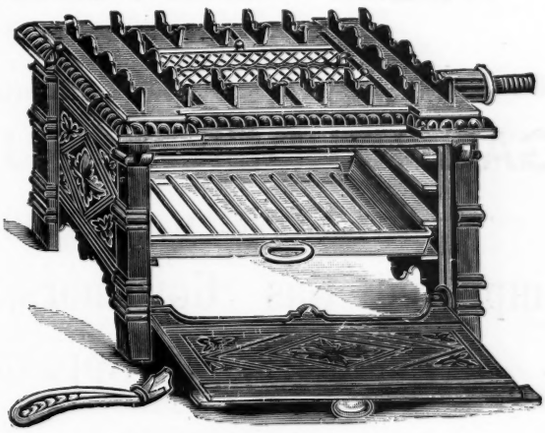

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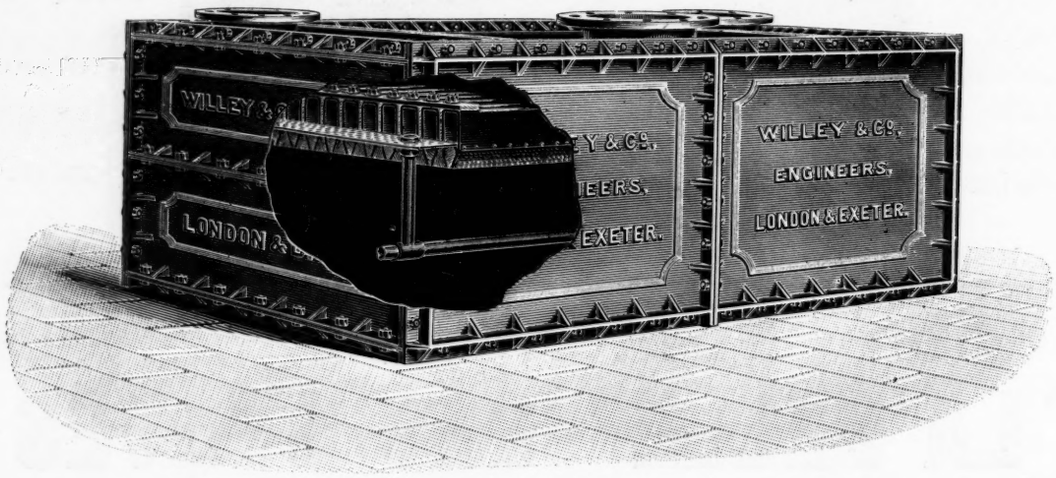

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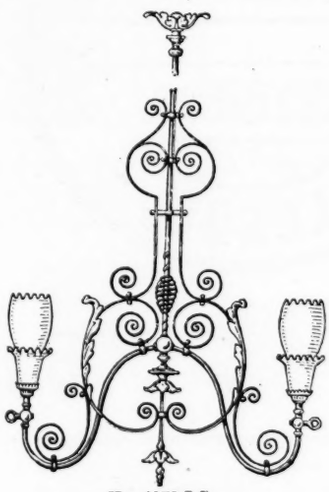

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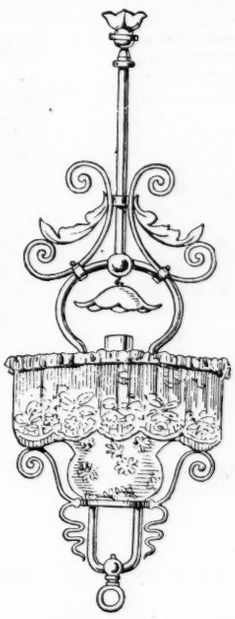

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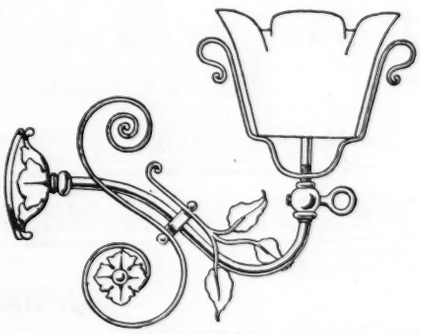

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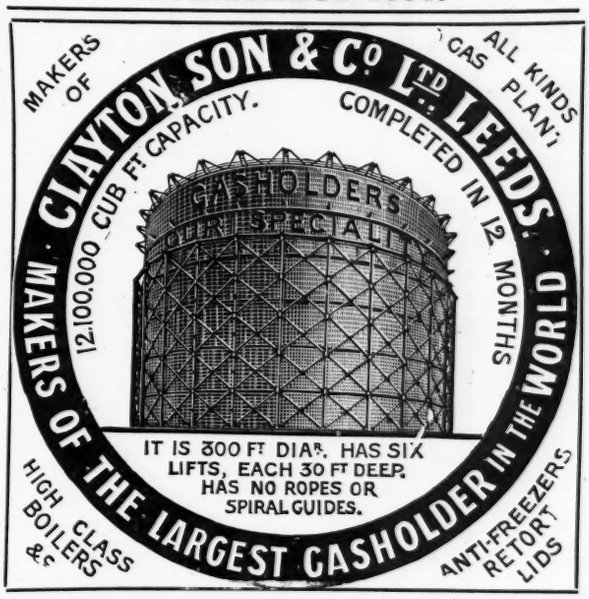
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[See also Advt. p. 940.

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